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FOOD INDUSTRIES

NATIONAL EDITION

● FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION

ling baby lima beans, quick freezing

JANUARY 1947

Frozen Food Report No. 2 – Part I Transportation Warehousing

Processing Food For Sterilization

Juicells – New Form of Canned Grapefruit

Market Research Reveals Pitfalls

Planning Plant Revitalization

Flume System Aids Brining and Siruping

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JANUARY, 1947 Volume 19, Number 1

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THE COVER

Deerfield Packing Corp., Bridgeton, N. J., uses a volumetric carton filler on its automatic packaging line. With baby limas, the line runs at 100 per minute. Filled cartons move along conveyor to automatic closing and sealing unit. Cartons are by Marathon. Food Machinery Corp. is the manufacturer of the filler.

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Sampson in the Temple

THE issues of the last coal strike are so vast that no one may ignore them. The greatest dangers we have faced in our comparatively short national history have come from within—from the people themselves. A present national danger arises from the rule-or-ruin policy that seems to motivate many of the more powerful labor leaders. John L. Lewis, like Sampson in the temple, occupies the place of greatest strategic importance for any one who might desire to impose his will on all of us.

Philip Murray, summoning the other national officers of the several big labor groups to aid UMWA, aligned himself with the evil cause. And when he analyzed the November election results as indicating that the "predatory interests" are out to destroy the labor movement, he showed unmistakably that he was completely out of touch with adult American opinion.

If the November elections meant anything, it was that the majority demanded a change. The greatest need of the moment is some way to settle strikes and keep them settled for a period of time long enough to get some work done in this country and build some houses.

Insignificant Predatory Minority

Common sense tells us there are too few persons of the type that might classify as "predatory" to have won that, or any election. In fact, the number of people who have incomes above $100 a week is an insignificant percentage of the total voting population. Those whose incomes are above $5000 a year constitute less than 1 percent of the voters, and less than one-half of 1 percent of the total population. Such a trifling number cannot possibly win an election.

Lewis Plans Continual Strikes

Power, prestige and wealth are very heady intoxicants. It requires remarkable strength of character for a man to maintain his stability when tremendous power reposes in his person. (Which is one of the reasons for the existence of boards of directors in corporations.) Mr. Lewis, strong man that he is, lacks the self-restraint that should be his if he is to be entrusted with so much power that he can close down American industry at will.

My few conversations with him have made it plain to me that he considers himself as a man far and beyond the capacities of other men in the field of political economy. Furthermore, one need only listen to his remarks about the need for "a constantly expanding economy" to realize that he has a long-time program that is as definite as was Hitler's "Mein Kampf." Mr. Lewis has stated in my presence that there will be more strikes and still more strikes to force the "expansion of our economy" that this self-anointed "superman" believes to be vital to the country. He wants a prosperous America, but prosperity must be in accord with the Lewis concept, and must be forced upon us in the manner he specifies.

Paralyzing the National Economy

His actions that paralyze the national economy, plus his tactics of striking the mines by the "no-contract" without stating what he wants and waiting for penitent mine operators to come to him with offers, indicate all too clearly that popular restraints must be placed upon him and any leaders of organized labor or business or politics whose ambitions outrace their sense of duty as citizens. Every one of us must be made to realize that whatever power is reposed in us is to be used for good and not for gratification of personal vanity. As Senator Ball puts it, this may hurt unions but it won't hurt labor.

Unions—Not Workers—Need Curbs

What Congress may do when it revises the laws relative to labor unions cannot make matters any worse for the nation than they were in December when industries were forced to shut down for lack of fuel. Nor will any restraints imposed on labor leaders injure the cause of the worker, unless he uses them to injure himself—like a bricklayer in White Plains, N. Y. who, on December 6, refused to lay more than 150 bricks a day because he could not be discharged.

Under the American Constitution the majority of the voters in this country determine what shall be done. And in the coming months the people must regain their powers, and settle the issue definitely—come what may—so that nobody can again build up private powers that can challenge the authority of our government. We don't want any more Sampsons who can pull down the economic temple.

EDITOR

The Talk of the Industry

• For Uncle John, the workers strike, but for Joe, they starve or work!

• Robert Nathan's report to CIO, that industry can raise wages 25 percent without raising prices and still make wartime profits, makes it clear where Hen. Wallace got his ideas.

• Borden Company has cancelled its leases on a lot of small cheese plants in Wisconsin. What that news does not tell is the reason why they were leased in the first place. It was to keep a supply of cheese coming during the price control period. Ceilings existed on finished products but not on milk.

• One percent more babies were born in the first nine months of 1946 than in a comparable period in 1943 —the previous record year. And the September 1946 birth rate was the highest on record. Think of it: 2,259,000 new customers for the food manufacturers! No wonder there's a housing shortage. Who says this is to be a nation of old folks?

• VARIOUS groups in this country who feel that they are not getting a square deal should first mind their manners. In fact, the first job that all such self-conscious, self-pitying groups should tackle is to cultivate manners that would put the rest of their fellow-men to shame.

It is regrettable that about eight out of ten Americans act as if good breeding, good manners and ordinary politeness were a sign of weakness. And, of course their only way to show their imaginary, superior strength is to be impolite, abusive and quarrelsome.

At times American conduct overseas, during recent years, has been most regrettable, but stressing the situation here at home is the purpose of this comment.

A large motor car manufacturer once allowed the daily press to see a stenographic transcript of remarks made during collective bargaining. Much of the language from one side was unprintable.

A friend reports that a female of a non-caucasian minority group kicked him on the shins in a New York subway, apparently for minding his own business.

Nearly everyone can testify to members of other minority groups bumping into people by insisting on walking on the left and performing similar violations of good manners. This is not to uphold equally bad manners in majority groups, but to point out that good breeding and good manners are a part and parcel of strength and superiority.

The first step toward emergence from an undesirable minority group is to acquire the outward characteristic of those who know how to act in a civilized manner and get along with their fellow man.

• H. J. Heinz Co. had quite a time during the 27-day Pittsburgh power strike right in the midst of the tomato packing season. Anticipating that the threatened strike might materialize, they resurrected some old power generating equipment that had long been idle, and kept the Pittsburgh plant going. They had plenty of process steam. But some 100 carloads of tomatoes had to be diverted to other plants, for the emergency power supply was inadequate.

• Subscriber Reg. Cahill, of Cahill's Dehydrators & Quick Freezers Pty. Ltd. telephoned Christmas Greetings all the way from Sydney, Australia—our first transoceanic telephone conversation of any sort. Thanks, Reg., and a prosperous New Year to you. Oddity of the conversation was the fact that it was Tuesday in Sydney and Monday here.

Hors d'Oeuvres

• *By way of the public prints comes a recipe for "sweet potato" cookies, which specifies, among other things, 1¼ cups of sugar, 1 cup of raisins, 1 cup of nuts and ½ cup of riced sweet potatoes. And if the nuts and raisins object to the name, they can go back to their fruit cake or nut bread, or vice versa.*

• Borden's says that the increase in milk consumption over five years ago is greater than for any food other than canned soup. "Maybe it's the large number of new brides that sent canned soup sales zooming, but everybody drinks milk." Wonder if Borden's has thought this thing through.

• *The Farm Journal quotes a railroad executive as saying that farming is the only occupation in which a man can stay, year after year, and never make a nickle. Oh, yea?*

• The QMC has discovered that female mosquitoes find the hosts upon which they feed by sensations through their antennae. Maybe that buzz you hear in the still of the night is just a tuning in operation.

• *Nature, the British publication, reports on the moon's effect on plant processes. The investigators conclude that "if lunar effect does exist, it is so obscure as to have no value in agricultural practice." It's obscure, all right, but don't try to tell the folks in the Tennessee hills that it has no value in practice.*

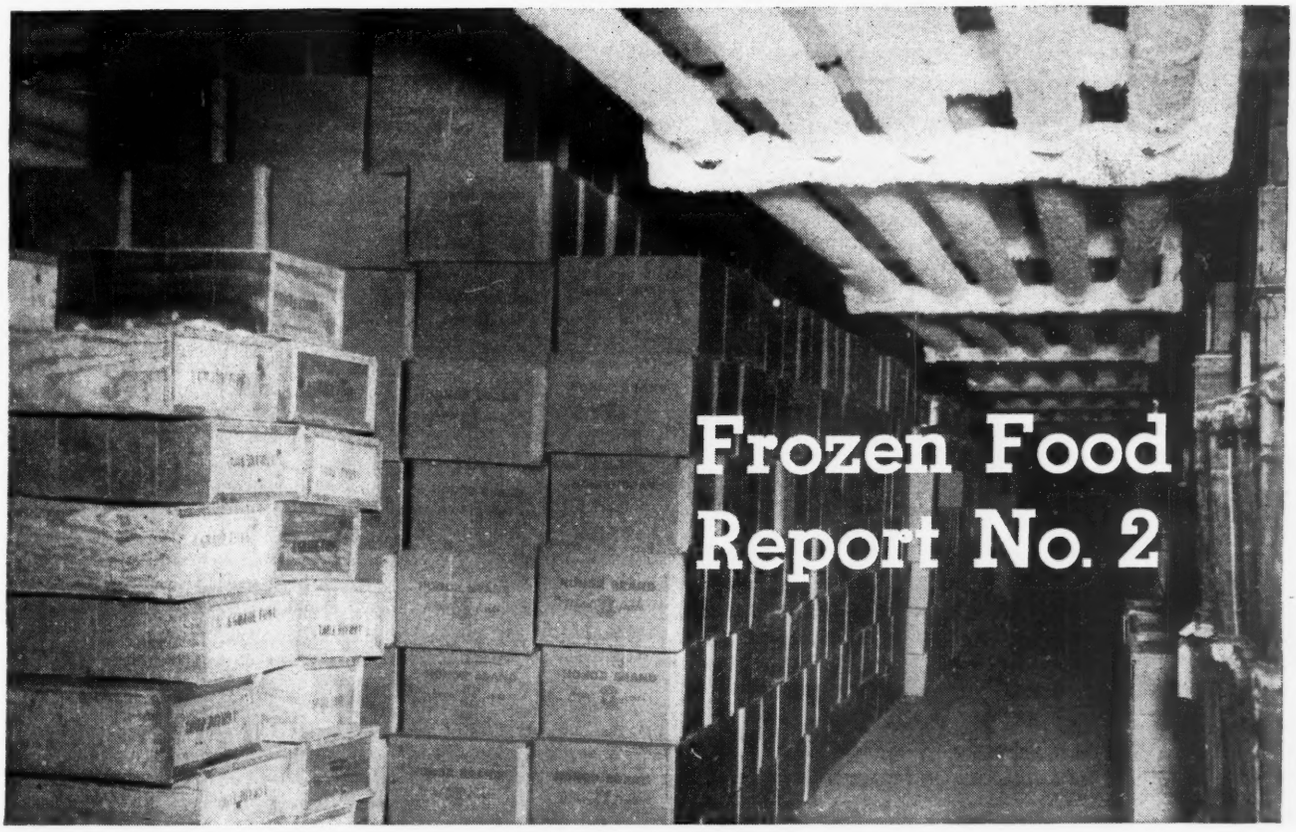
• In the matter of Washington Canners Cooperative Association and the International Union of Operating Engineers, the NLBR tells of a consent election. "It appears from the Tally of Ballots," says NLRB in two pages, "that a collective bargaining representative has been selected, since of the approximately 2 eligible voters, 2 cast valid votes, both of which were for the union." It was approximately close too, considering the landslide proportions.

• *It was mighty nice of Mr. John L. Lewis to say we could use his coal until April, at least. Just shows what the Christmas spirit can do, especially when Mr. John Q. Public gives a helping push.*

• Handlers at slaughtering plants use electric prods to speed up the unloading of livestock. This might help if someone can figure out a way to speed up the handlers.

• *An executive of one of the Big 4 meat packers has been elected president of National Dog Week, Inc. We didn't like to ask whether this was foresight or just a hobby.*

J.A.J.J.



Frozen Food Report No. 2

Transportation, warehousing and marketing are factors that will influence the quality and future production of frozen foods. The status and the trend of these three key factors are shown in this comprehensive industry survey

By C. R. Havighorst, Associate Editor
Food Industries, San Francisco, Calif.
and
H. C. Diehl, Director
The Refrigeration Research Foundation, Berkeley, Calif.

SPURRED by ever increasing demand, frozen food processing operations are being enlarged at a rate which threatens to outstrip the capacity of distributional facilities. Packers must therefore pay increasing attention to warehousing and transportation bottlenecks and the hazards of marketing, which determine whether high quality will be retained after the product leaves the plant.

The industry's ability to increase production was demonstrated during the war period. Also, established packers have learned that the key to continued consumer acceptance lies in high quality standards. With the industry's coming of age, it is now logical to recognize the importance of effecting economies wherever possible in view of the certainty of price competition. It so happens that the factors that tend at present to limit the industry's rate of expansion are also the points where some economies may be effected—in transporting, warehousing and marketing the frozen commodities.

The need for continuous low temperature environment as protection for the product limits and controls the movement of frozen foods to consumers and is a determinant of the rate and extent of the industry's expansion. Safe transportation requires specially insulated and refrigerated facilities. Frozen foods must be kept in freezer storage, an expensive form of stock warehousing. And the location and availability of freezer space governs all wholesale distribution plans and retail marketing operations. Unless these various factors are understood and evaluated, the frozen food

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Frozen Food Marketing

Co-Authors of F. I. "Reports" Grew Up With Frozen Foods

Havighorst and Diehl biographies reveal a team with unusual technical and business experience

C. R. Havighorst

C. R. "HAVIE" HAVIGHORST has been associated for over 20 years with the marketing and manufacturing of all kinds of processed and fresh fruits and vegetables, and is especially familiar with the field of frozen foods. While with the Pacific National Advertising Agency of Seattle, Wash., and later with fresh fruit, canning and frozen food companies, he completed four annual market surveys of the U. S. encompassing the 138 metropolitan markets. These surveys entailed trips through these markets each of the four years.

"Havie" has worked in both canning and freezing plants as a supervisor or plant manager, and he has a first hand knowledge of marketing. His part in this Frozen Food Report is based upon direct business experience and on formal training in the theories and practices of marketing in which he majored while attending Gonzaga University, Spokane, Washington.

Western Editor

Better known in the West where he has been advertising and sales manager of two of the largest frozen food companies in that region, he became a member of "Food Industries" staff in 1944. He is an associate editor on the national staff, and, in addition, is now the editor of the Western Section, which makes its debut in this January issue.

Co-author with H. C. Diehl of Food Industries Frozen Food Report No. 1, C. R. Havighorst was born June 6, 1902, at Guthrie, Oklahoma. He graduated from Gonzaga University, Spokane, Wash., with the B. S. degree. When active in advertising he held the positions of account executive and research manager. He was also engaged at one time in the management and promotion of retail grocer voluntary organizations, which entailed intimate knowledge of the wholesale grocery field and of retail grocery operations.

H. C. Diehl

H. C. "DUTCH" DIEHL has been prominent in frozen food research since 1924, when he began work on cold pack fruits in the Pacific Northwest with the USDA. In 1931 he established the USDA Frozen Pack Laboratory at Seattle, where he was later in charge of all processed foods research. Shortly thereafter (1941) he assumed the duties as chief of the Commodity Processing Division at the Western Regional Research Laboratory, Albany, Calif. In other fields of refrigeration he established the USDA field stations at Yakima and Wenatchee, Wash., which made investigations on storage and transportation of all fruits and vegetables.

Refrigeration Research Director

In 1943 "Dutch" became director-secretary of The Refrigeration Research Foundation, (Berkeley, Calif.) where he conducts a program of industrial research and technical service for the refrigerated warehouse industry. Much attention is devoted to problems connected with the freezer storage of frozen foods in The Refrigeration Research Foundation projects under his control.

During World War II h_ assisted the Office of the U. S. Quartermaster General in the development of the frozen food procurement and use program for the armed forces. He was also in charge of the USDA Dehydration Training School program in 1942 as a war emergency measure.

Senior author of the 1945 Food Industries Frozen Food Report, H. C. Diehl was born in Bridgeport, Conn., June 6, 1894. He graduated from Michigan State College in 1918 with the B. S. degree, subsequently doing graduate work at Johns Hopkins University, University of Maryland and Washington State College. He served in World War I in the Chemical Warfare Service. He is the author of numerous articles and bulletins.

(*Continued from preceding page*)

industry can conceivably get too big for its own good and eventually face a chaotic condition similar to that faced by the canning industry at the end of the first world war.

Joint Investigation

Recognizing the industry's need for suitable guides, FOOD INDUSTRIES presents, in this second Frozen Food Report, a picture of these important aspects of the frozen food industry. Since little material was available for this purpose, an investigation was undertaken jointly by FOOD INDUSTRIES and *The Refrigeration Research Foundation*, involving contacts with executives in the industry and the gathering and analysis of basic information. The results, appearing in this Report, show the current status and the probable future trend of the factors on which progress now depends. In the absence of such information, producers could easily encounter a condition of producing more than market facilitates can absorb.

A year's time has been required for the making of the survey and the preparation of the results for publication. Questionnaires were sent to over 7,000 transport, storage, distributional and marketing executives. The authors personally talked with hundreds of others concerned with the distribution, marketing flow and storage of frozen foods, during several trips over the nation.

Value of the Data

The data presented are believed to be the most accurate now available for publication. In some cases, the information is limited. It was not possible to investigate every phase of the distributive, storage and marketing problems. The Report is not presented as a prediction or prophecy of the magnitude to which the industry may expand, nor does it present all the problems facing such a potential expansion. It is offered in the same manner as was the 1945 FOOD INDUSTRIES Report on Frozen Foods—as a basis for study and individual interpretation, with such comment and graphic presentation as may be helpful in the understanding of a much discussed subject.

The cooperative survey is identified in this Report as the F.I.-T.R.R.F. 1946 Frozen Food Survey. Answers to questionnaires will be found in the subsequent sections.

TABLE I—Incidence of Error Occurring in Food Industries 1945 Frozen Food Production Charts
(See "Food Industries Reports on Frozen Foods." March, 1945)
(1944-45 Actual Production figures courtesy of National Assn. Frozen Food Packers)
(thousands of pounds)

Chart description (Production of)	1944 Production indicated From	To	1944 % of total packs	1944 Actual pack	1944 Percent error	1945 Production indicated From	To	1945 % of total packs	1945 Actual pack	1945 Percent error
Total U. S. Packs:										
Fruits and berries	218,000	268,000	.....	323,886	Lo 17.3%	268,000	327,000	.....	430,176	Lo 24%
Vegetables	228,000	294,000	.....	237,092	Correct	244,000	378,000	.....	307,977	Correct
5 Selected Vegetables:										
Peas	77,000	85,000		79,152	Correct	87,000	101,000		103,884	Lo 2.8%
Spinach	23,000	36,000		31,947	Correct	26,500	44,000+		36,721	Correct
Beans, snap	25,500	36,500	78	23,753	Hi 7%	28,500	44,000+	73	31,460	Correct
Beans, lima	29,000	30,000		29,550	Correct	31,000	32,500		28,476	Hi 8%
Corn, cut	18,000	24,500		20,983	Correct	20,500	30,500		25,551	Correct
Selected Fruits:										
Strawberries	16,000	58,000		34,825	Correct	60,000	67,500		36,917	Hi 39.9%
Cherries, RSP	45,000	56,000		55,059	Correct	47,000	62,000		16,144	Hi 65.7%
Apples and sauce	29,000	44,000+	71	52,391	Correct	34,000	44,000+	73	92,985	Correct
Apricots	14,000	.....		42,617	Lo 67.0%	15,000	.....		65,158	Lo 77.0%
Peaches	18,000	21,000		45,563	Lo 54.0%	22,000	23,000		103,634	Lo 88.0%

Hi—High (Overestimate) Lo—Low (Underestimate)

1945 Production Forecast Versus Actual Pack Data

Output of frozen fruits and vegetables shows hits and errors in projecting the trend lines forward

ALTHOUGH "Frozen Food Report No. 2" does not undertake to forecast the tonnages of future production, the authors believe that readers will be interested in the degree of accuracy of the forecasts of future put-out that were made in the March, 1945, "Food Industries Reports on Frozen Foods."

The 1947 report discusses the factors which will influence the immediate future of the industry. The 1945 report included a graphic presentation of the actual trend of production, with projections showing the potential production up to 1946. It is now possible to compare the forecast with the records. The comparison shows how nearly the prediction hit the mark and wherein it missed.

The percent of error in the 1945 forecast is brought out in Table I. In the overall estimates, the indications for total frozen vegetable production were correct. The actual production of frozen fruits and vegetables, however, was somewhat higher than the forecast. It is interesting to consider also the size of the carryover of selected fruits from year to year, as suggested and as found.

The projections on the charts could not, of course, take into consideration the abnormalities resulting from wartime shortages and demand. The increase in the pack of apricots and peaches in 1944 was unusual. There was, however, a shortage of canned fruits, especially certain types favored for re-manufacture. Also, packers could obtain sugar when other industries could not. Accordingly, there was a heavy demand from re-manufacturers (bakers, preservers, etc.) for apricots, peaches and apples from the 1944 pack of frozen fruits.

Conclusive evidence that apricots and peaches were intended for the re-manufacturing trade is the fact that only a little over five percent of the apricot and nine percent of the peach pack (1944) went into retail size cartons. If the increased wartime demands for these two fruits (peaches increased 28,554,000 lb. in 1944 over 1943 and apricots increased 32,616,000 lb. for the same period) were to be deducted from the total fruit pack of this year, it would be found that they account largely for the 17.3 incidence of error in the 1944 fruit forecast.

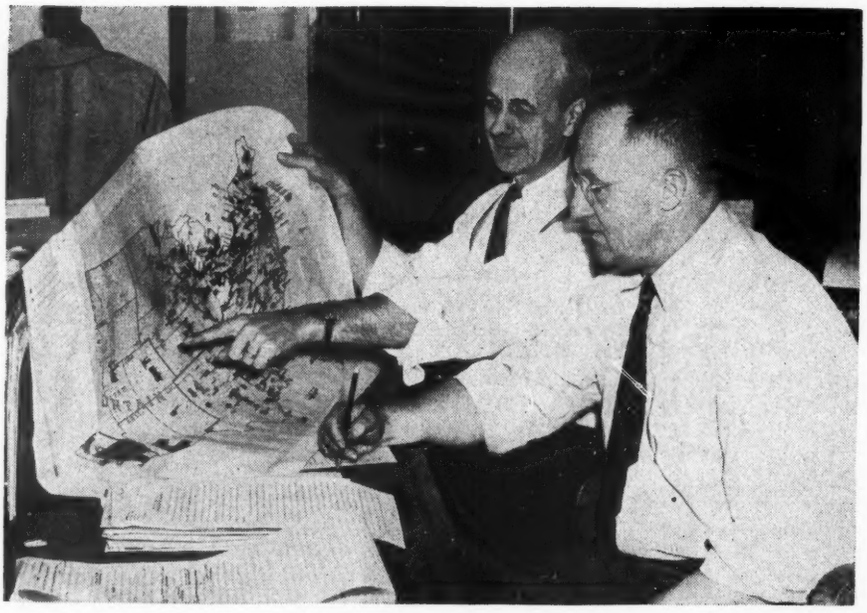
Carry-Over Problem

In the March, 1945, Report the industry was warned that an overproduction of apples and other deciduous fruits might create a serious carry-over. Remanufacturers would, in all probability, return to fresh and canned fruits since these products are traditionally lower in price and, not requiring defrosting, are more easily handled. In 1945 the sensational gain recorded for these three fruits (121,000,000 lb.) was greater than the net increase in the entire pack (106,000,000 lb.) and, as evidenced by package sizes, that portion of each fruit intended for retail trade was: apples 9.5 percent, apricots 7.5 percent, and peaches 9 percent. But with the end of the war in 1945 came new shortages (sugar, flour and shortening) in addition to the greater future availability of canned and fresh fruits. Unfortunately also, strong demand and wartime operation problems contributed to a lessening of quality control, particularly in these items which are especially sensitive to oxidation and quickly reflect low quality conditions. Hence some of the pack was of doubtful value to its owners.

Old Pack Residues

As a result of the condition created by these combined factors, a considerable tonnage of apricots (18,906,000 lb.)*, peaches (36,111,000 lb.)* and apples (29,517,000 lb.)* remained in storage in 1946 at the low inventory point for each of these three fruits. The minimum tonnage occurs in the month in which the new pack of the fruit in question begins. It thus represents the carryover from the 1945 pack. The total of these three items means a carryover of about 84,500,000 lb., representing nearly one third of the original 1945 total pack of these fruits.

* The figure for apricots was secured from the USDA July, 1946 Cold Storage Report, that for peaches from the August Report, and the figure for apples from the November Report.



C. R. "Havie" Havighorst and H. C. "Dutch" Diehl, co-authors of Frozen Food Report No. 2, are shown at work in the San Francisco office of Food Industries. Havighorst points to colored map, specially prepared for the part of the Report which will appear in February. Diehl checks messages. Teletype conferences were held with the editors in New York.

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J. M. Lemon..... Fish and Wild Life Service, U. S. Dept of the Interior.

Dairy Branch ..... Production and Market Administration (PMA-DAI).

Poultry Branch ..... Production and Market Administration (PMA-POU).

James Berry ..... Western Regional Research Laboratory, USDA.

R. C. Newton..... Swift and Co.

C. A. Richardson..... Association of American Railroads.

The Pacific Intermountain Express Co.

The Pacific Fruit Express Co.

The National Assn. of Refrigerated Warehouses.

The National Assn. of Frozen Food Packers.

Assistance Credit

The authors desire to express their appreciation of the aid rendered in the compilation and interpretation of data by their assistants, R. T. Prescott of The Refrigeration Research Foundation and E. B. Schmalz of the editorial staff of "Food Industries".

Industry Credit

For their valuable aid and cooperation in this survey, the authors extend their thanks to:

The Refrigerated Warehouse Industry,
The Locker Plant Industry,
Frozen Food Wholesale Distributors,
Cooperating members of the National Food Brokers Assn.

Errors Cancel

In the master chart for total fruit production in the 1945 Report, the high predictions for strawberries (39.9% overestimate) and for RSP cherries (65.7% overestimate) would help to counterbalance the underestimates made for apricots and peaches. In the case of the strawberry pack, however, the possibility of error was mentioned in the 1945 Report. In the case of frozen cherries, the pack dropped from 55,000,000 lb. in 1944 to 16,000,000 lb. in 1945, due principally to USDA restrictions on freezing this item and the short crop of the season—factors that could not enter into a mathematical projection of the past trend, although the presence of these restrictive elements was inferred in the text.

Estimates Correct

In the case of the production figures for vegetables, the overall estimates were correct for the two years. The three errors shown in the comparison table were negligible, and it would be impracticable to seek explanations for them.

Census Regions

United States Census Regions are shown on the colored map supplements furnished with the January and February sections of Frozen Food Report No. 2. Map No. 2, with Frozen Food Marketing, will show populations of city and county metropolitan areas. It will carry the names of the Census Regions.

Map No. 1, in this issue, shows production and distributive area data. Census Regions are outlined. In order to avoid confusion, however, the names of the regions were omitted from this map. The names of the states in each region are given with the tables on the back of Map No. 1.

Frozen Food Industry Package

After the February part of Frozen Food Report No. 2 has been published, there will be available a "complete package" of reprints on the Frozen Food Industry. It will contain:

1—Transportation and Warehousing, and Distributional Facilities Map.
2—Marketing of Frozen Foods, and Marketing Areas Map.
3—New Frozen Food Directory, Directories on Packers and Distributors (February, 1947, edition).
4—Report on Frozen Foods (Production—published March, 1945).
5—"So You Are Going Into Freezing" (Production & Distribution checklist).

The complete package will sell for $3.00 each (10 or more, $1.00 each).

Frozen Food Report No. 2

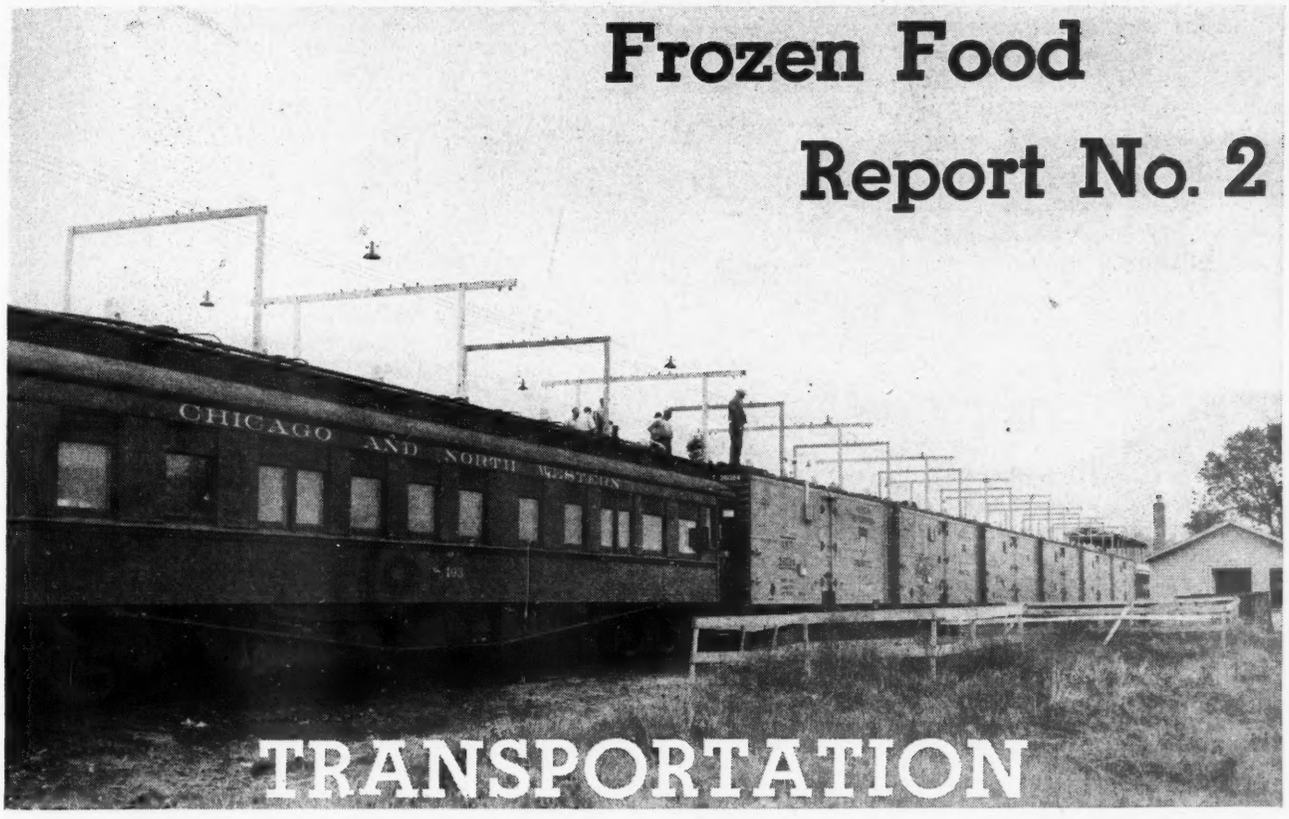

Fig. 1. The Refrigerator Car Research Bureau of A. A. R., the Department of Agriculture and the U. S. Bureau of Standards jointly conducted this test, last October. Using six specially built ART reefers, with insulation varying from 3½ to 6-7 in., the cars were loaded at Hillsboro, Ore., for shipment to Cincinnati. The cars carried 450,000 lb. of Birds Eye frozen fruits and vegetables.

Future expansion of the frozen food industry will require the development of adequate transportation facilities. Operators of rail, truck, ship and air transport are busy with new designs, new construction and new schedules

By C. R. HAVIGHORST, Associate Editor
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and

H. C. DIEHL, Director
The Refrigeration Research Foundation, Berkeley, Calif.

REFRIGERATED transportation, an important part of the low temperature pipeline to markets, plays a vital role in frozen food production and marketing processes. From agricultural regions to freezing plants, to refrigerated warehouses and wholesalers and thence to retailers and consumers, refrigerated transportation is indispensable to this industry. Although railroads have hitherto carried most of the frozen foods shipped over the country, refrigerated truck lines and marine transport are now bidding for their share of this business.

The initial and only means of transport open to pioneer frozen food packers was the reefer car, originally designed and insulated to carry perishables at temperatures around 35-40 deg. F. Only a few shipments were made in such reefers before the railroads began converting some of them into heavily insulated cars by adding more insulation to the ceilings, walls, ends and floors. Then, by increasing the proportion of salt used with the ice, lower temperatures were obtained.

It was in those days of innovations, when the first car of frozen fruits and vegetables crossed the continent, that electric fans were first utilized to cool a reefer. Approaching Laramie, Wyoming, with ambient temperatures hovering around 100 deg., the thermometer inside the car showed the lading was rapidly reaching the maximum temperature set for this shipment. The Pacific Fruit Express Co. man, accompanying this car, wired ahead requesting all the electric fans that could be found in the town. Upon arrival there, the fans, of the type used for cooling offices, were arranged throughout the car, reducing the temperature.

Reefer Temperature

Research concerning refrigeration and temperature variations in reefers used for frozen food shipments, which has recently been given considerable attention, began at least as early as 1929. K. V. Plummer, now vice-president of Pacific Fruit Express Co., accompanied the first transcontinental reefer carrying frozen fruit and vegetables, equipped with thermometers installed in the car and throughout the load (Chart I). This shipment, made in 1931, moved from Portland, Ore., to Boston, Mass., arriving there in good condition. The car used (PFE 100264) was a standard end-bunker type converted to become a heavily insulated car by the addition of enough insulation to give 6 in. of protection at sides and ends and 7 in. for floor and ceiling.

Transit refrigeration tests, conducted by USDA, in 1945, involved eight cars. Two were 50 ft. end bunker cars, two were overhead brine-tank cars and four were standard 40-ft. Preco fan-equipped cars. Of the Preco cars, two had wall racks and two wall ducts. These cars moved under standard refrigeration plus 30 percent salt. Cars were iced prior to loading for precooling purposes. Immediately following loading, the ice and salt in the bunkers were replenished and the car began its trip. This test was conducted by Edwin Smith and Fisk Gerhardt, Bureau of Plant Industry, Soils and Agricultural Engineering, USDA.

The heavily insulated end-bunker reefer record (Chart II) shows a wider variation in temperatures than that of the other three types. Maximum commodity temperature remained slightly above 20 deg. F. for most of the trip until arrival at point of destination, when it rose to above 25 deg. Average commodity temperature stayed below 15 deg., and the minimum commodity temperature around 5 deg. or lower, until arrival of the car. From the technical standpoint, these uneven temperatures and especially those above 15 deg. are not desirable, even though the lading arrives in fair condition. It is suggested that a more even temperature could be maintained in this type of car by the use of fans.

The heavily insulated overhead brine-tank type of car (Chart III) appears to be the most suitable for the transportation of frozen commodities. It showed less temperature variations than the other types, with maximum commodity temperatures remaining at between 15 and 20 deg. and the average commodity curve at around 15 deg. for most of the trip. Minimum commodity temperatures stayed at around 10 deg.

The fan-equipped reefer type of car with 3½ in. of insulation (Chart IV), evidenced temperature fluctuations during delays while reicing or on side tracks. While in motion it provided temperatures similar to the other types. This type of car is recommended for short hauls or for shipments where there will be no long delays in transit and where the cars are unloaded promptly on arrival at destination.

Wall racks and wall ducts both provided a satisfactory air channel between the frozen lading and the wall of the cars equipped with fans. Air circulation, based on commodity temperatures in top and bottom layers, was better in cars with wall ducts. Obviously, fan cars require heavier insulation to protect the load when cars are idle. Improved train schedules and elimination of long stops should help to minimize temperature fluctuations in fan cars.

In these USDA tests, four to six carloads were used. Each car was equipped with a set of electrical resistance thermometers. The thermometers were placed in identical locations in each car, taking approximately eight commodity temperatures and four air temperatures. In cases where commodity temperatures were taken, the sensitive element of the thermometer was put inside the middle package in the shipping case. The master cable was fastened to the ceiling of the car. Twelve thermometer drops were connected to this master cable, which extended through the upper door sill of the car on to the roof where temperature readings were obtained by connecting a reading box to the master cable. Readings were taken generally four to six times per day (24 hours). Upon arrival at destination commodity temperatures were taken with hand

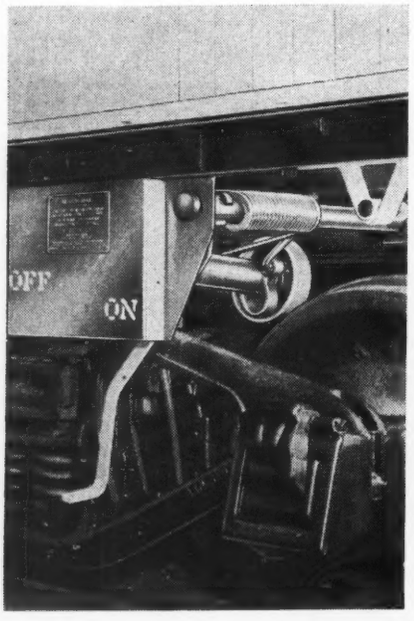


Fig. 2. The drive assembly is here ready to operate the Preco fans off car wheel.

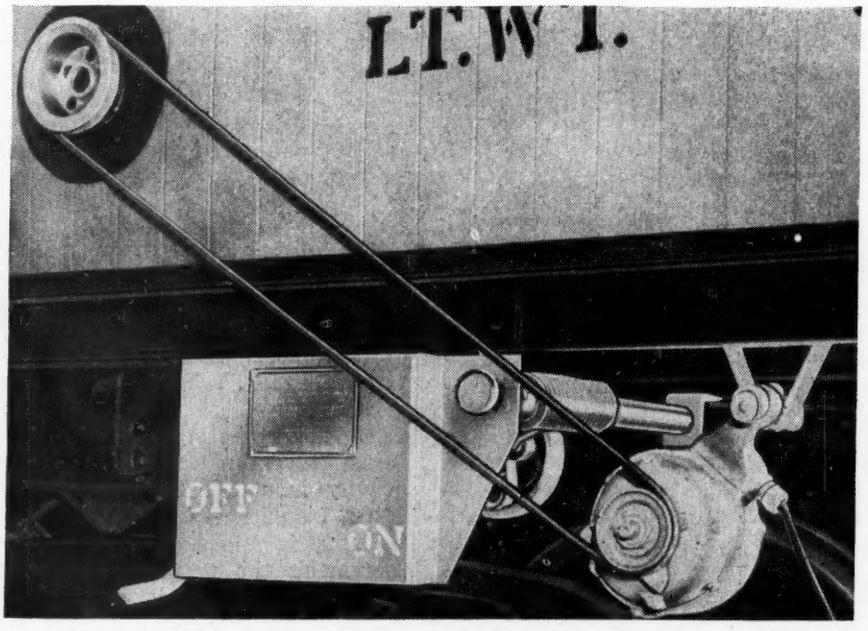


Fig. 3. With the drive assembly disengaged and attached to the motor, the Preco fans provide circulation of cold air while the car is sidetracked or delayed at a way station.

thermometers as the cars were unloaded.

The chart, showing temperature conditions in the first transcontinental shipment of frozen fruits and vegetables (Chart I) so closely rsembles the tests conducted by USDA in 1945 that it might seem that little progress has been made in improving refrigerated rail cars. This is not entirely true, however, because the earlier shipments were given an opportunity to arrive at point of destination in better condition.

At the outset, little was known about the railroad's ability to transport frozen foods safely, so every precaution was taken to assure safety in transit. The temperature of the product and packages was brought down as close to 10 deg. F. as possible and reefers precooled to as close to this temperature as practicable. This practice is still followed by some shippers. Some packers today, however, load cars with incompletely frozen merchandise or frozen goods with temperatures as high as 20 deg. or higher, apparently expecting that car refrigeration will lower the product temperature. The products may deteriorate beyond the point of usefulness, even though the receiving warehouse immediately lowers their temperature to 0 deg. F., or below. The advantage of a product temperature of 0 deg., or lower at car loading time is, of course, obvious, as is the loading and unloading to protect the product against unnecessary exposure to ambient temperature. Even with the fastest and most protected handling and the best reefers the movement of frozen foods, especially in summer months, is hazardous. The job can be done and every precaution possible is worth its cost. The value of such practices as loading and unloading through tunnels, proper handling of salt and ice, provision for positive and continuous air circulation in cars, and rapid movement all along the way are already well known.

Reefer Construction

Although 0 deg. is desirable for most frozen foods, and even subzero for some, the railroads, or car companies have yet to construct a reefer that will consistently hold a loading below a range of 10 to 15 deg. F. on a normal transcontinental trip. From the practical angle, railroad companies wonder if the frozen food industry would be willing to pay premium rates for reefers offering such low temperatures.

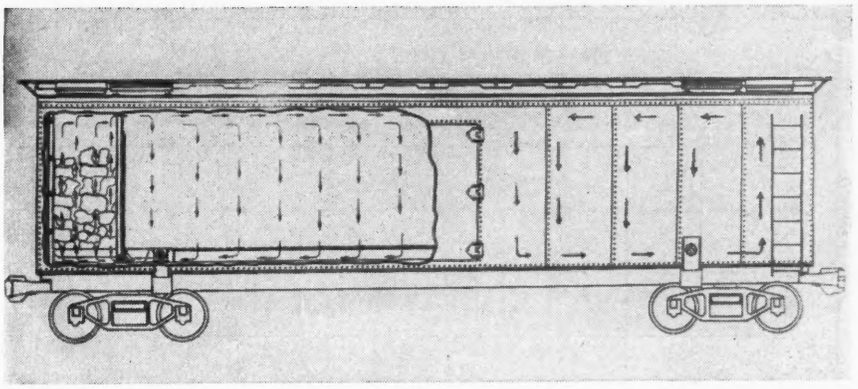


Fig. 4. The air flow in the Preco fan cars passes through the salt and ice packed end bunkers. All heat factors were carefully checked in analyzing the 1945 test.

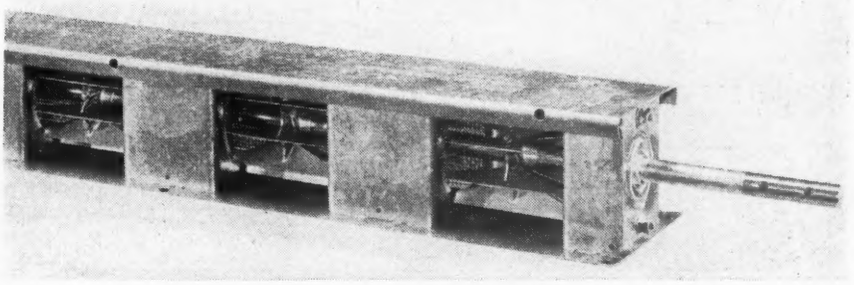


Fig. 5. This is a closeup partial view of the exhaust side of the blower assembly. The screen has been removed to give a better view of the Preco fans.

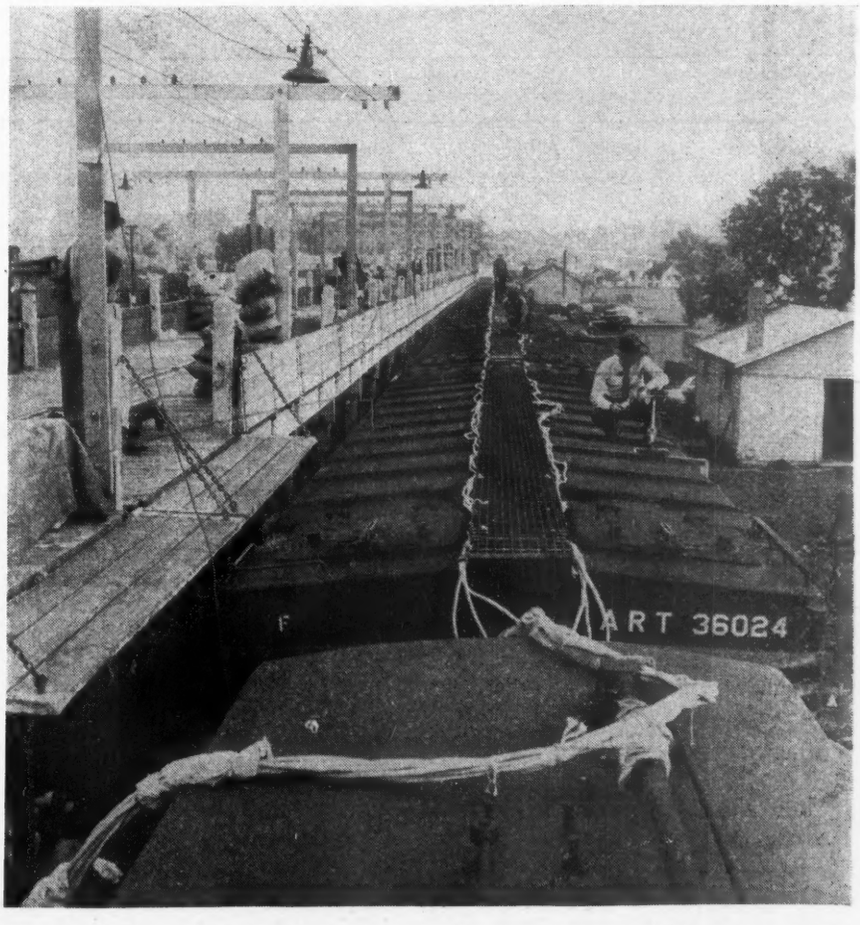
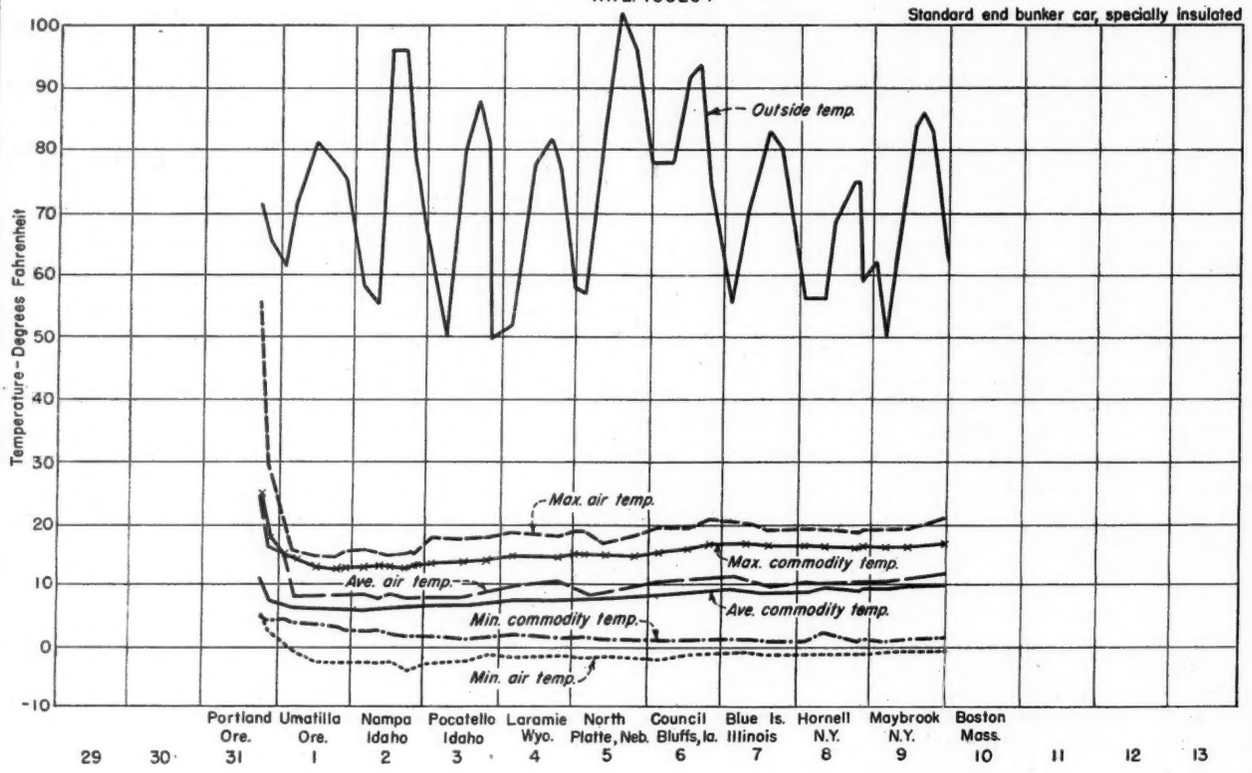


Fig. 6. This view shows the eight miles of cable over the roofs of the six cars in the 1946 test. The C&NW business car housed the Brown electronic precision indicator.

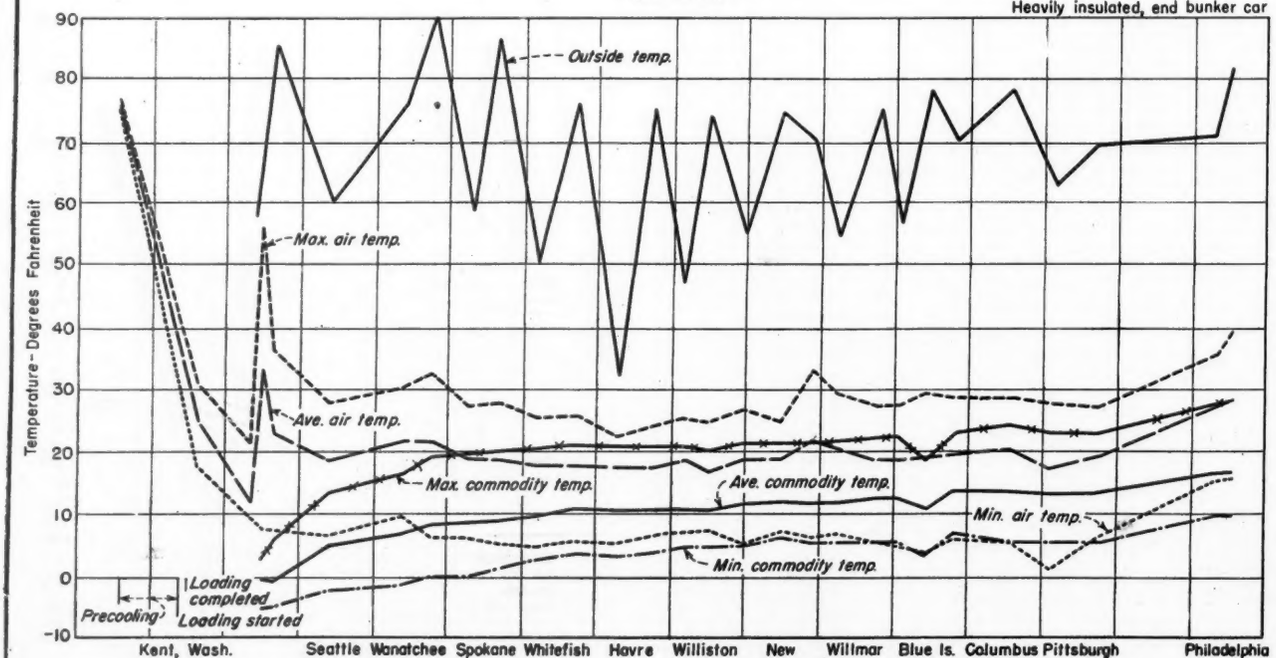
REFRIGERATION TEST ON FROZEN FRUITS AND VEGETABLES FROM PORTLAND, OREGON TO BOSTON, MASS.
AUGUST 31 TO SEPTEMBER 10, 1931
P.F.E. 100264

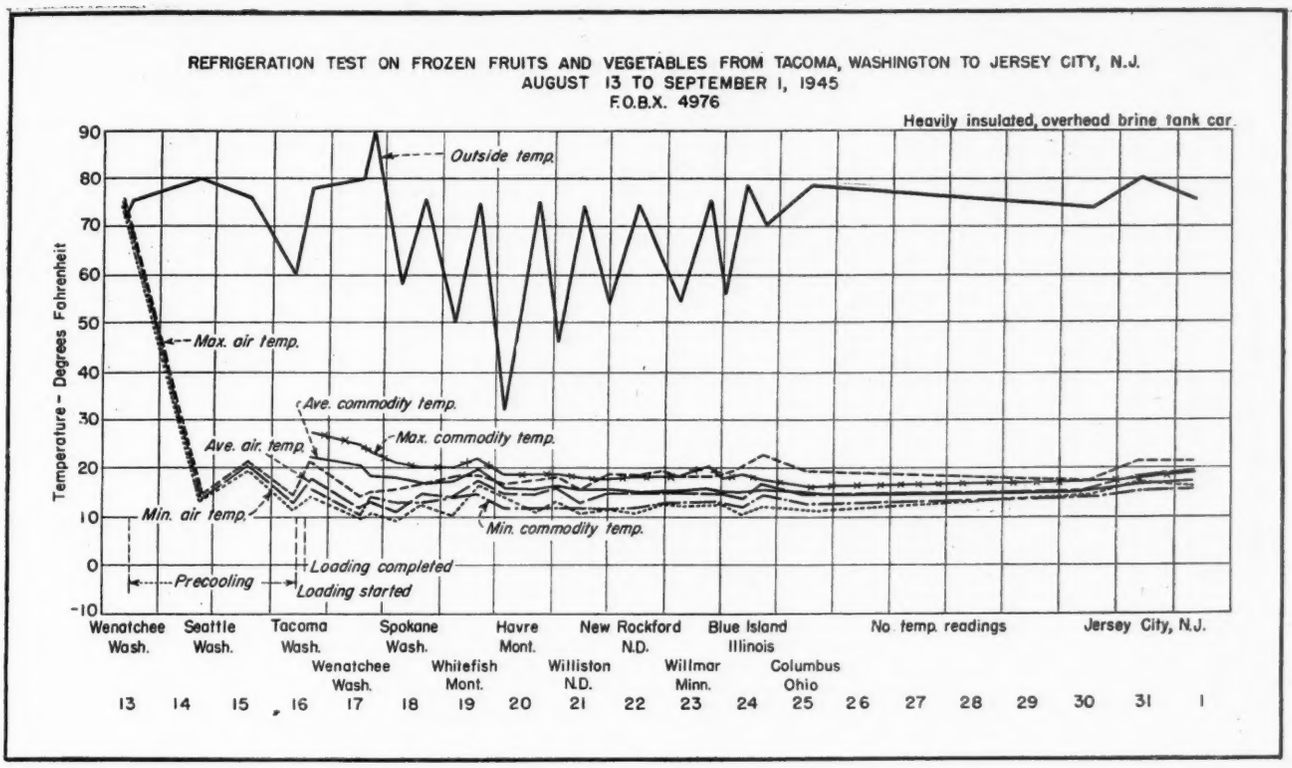
Standard end bunker car, specially insulated

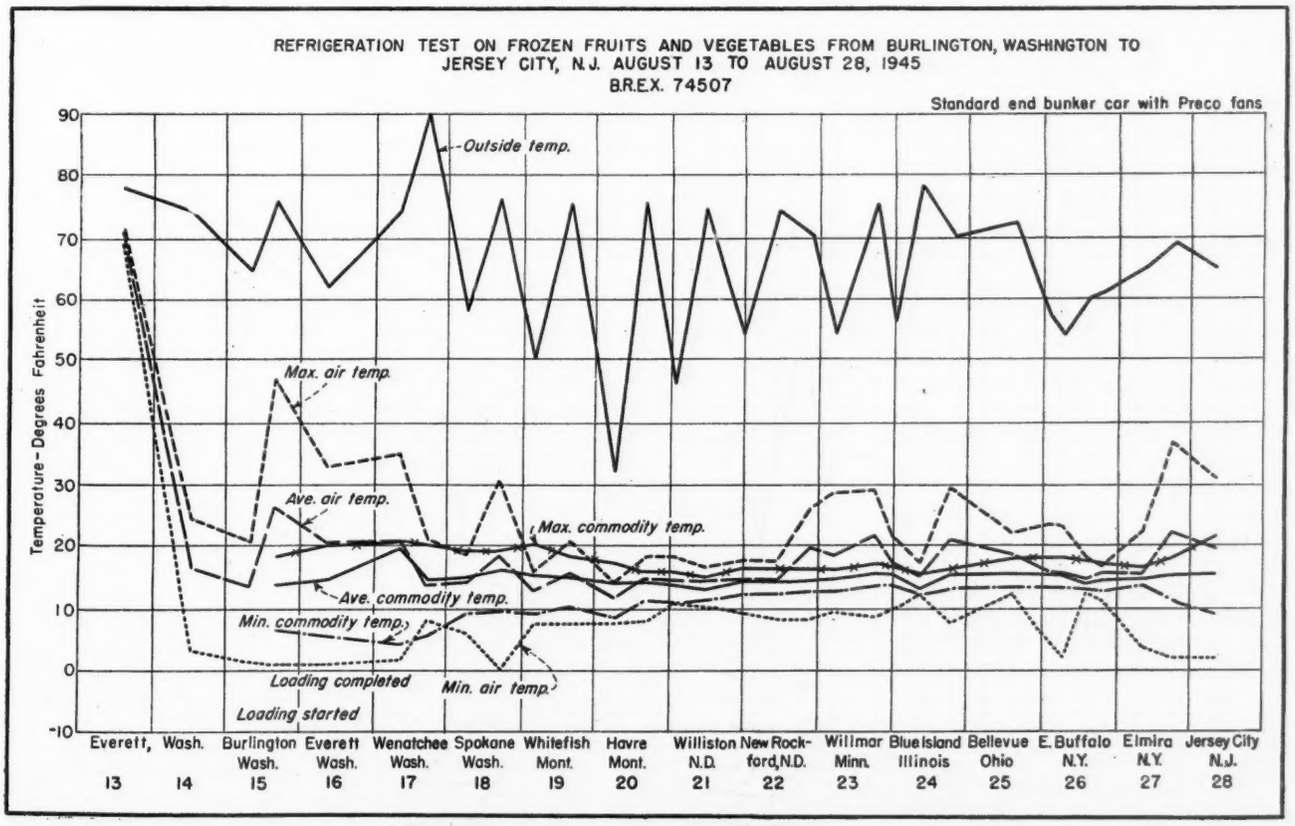


REFRIGERATION TEST ON FROZEN FRUITS AND VEGETABLES FROM KENT, WASHINGTON TO PHILADELPHIA, PA.
AUGUST 13 TO AUGUST 28, 1945
B.R.E.X. 312

Heavily insulated, end bunker car







Beginning with Chart I, the 1931 test at top of opposite page, the four tests described in this report are graphed. All but the first were conducted by USDA.

CHART I—This first test of its kind was made in a standard refrigerated end bunker type car, which had been converted to heavy insulation for the test. Due to rising temperatures at the outset, ordinary office fans were utilized at Laramie.

CHART II—The heavily insulated end bunker record shows a wider variation than do the other three types. Commodity temperatures varied from 15 to 20 deg. between maximum and minimum, the former rising to as high as 25 deg. at the end of trip. It was concluded that more even temperatures could be maintained by the use of fans.

CHART III—The heavily insulated overhead brine tank type car appears to be the most suitable for the shipment of frozen foods. It showed less temperature variations than the other types, the maximum remaining at between 15 and 20 deg. and the minimum around 10 deg.

CHART IV—This standard end bunker equipped with Preco fans and 3½ in. insulation showed temperature fluctuations during delays for reicing or while side tracked. While in motion the car provided temperatures similar to the other types. This type is recommended for short hauls or for shipments where there will be no long delays in transit or at the unloading station.

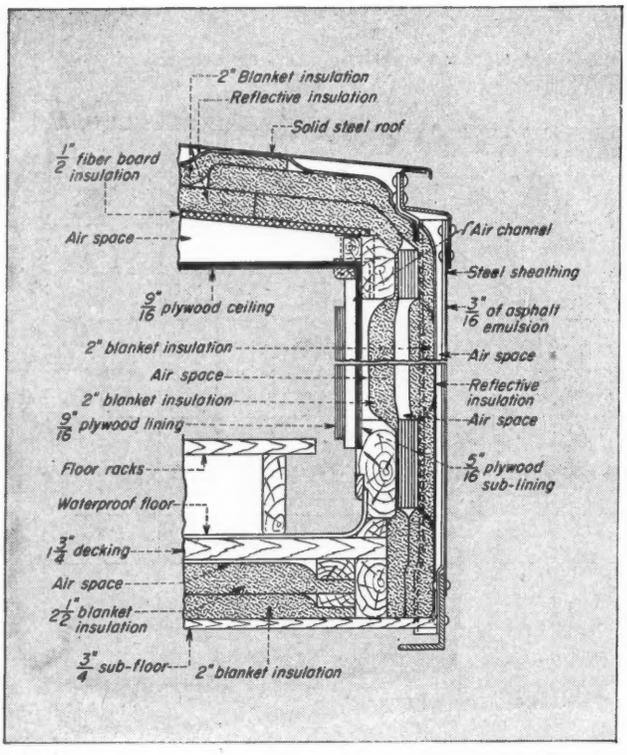


Fig. 7. The new PFE standard reefers will incorporate many late developments in the construction of lighter insulated cars.

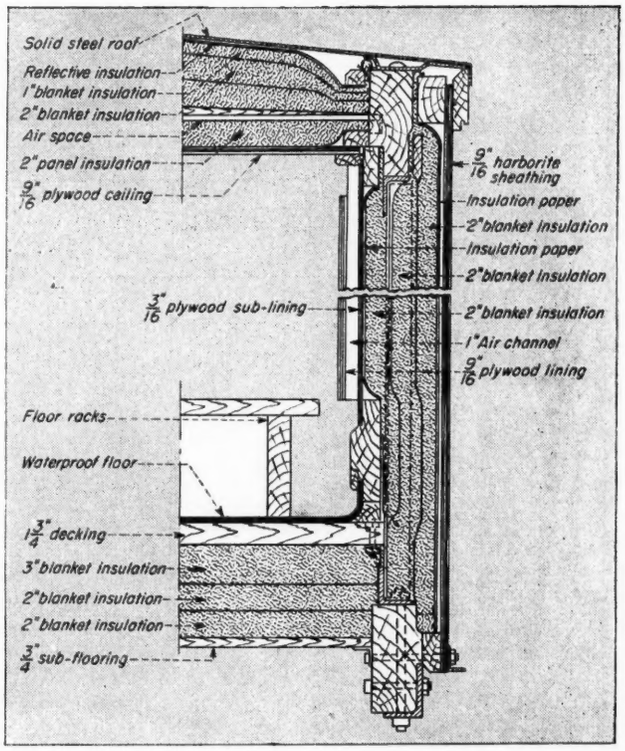


Fig. 8. "Superinsulation" replaces the term heavy insulation in this design for the new PFE cars to transport frozen foods.

There is no doubt that cars could be constructed that would provide sub-zero temperatures. The cost factor of freight rates, however, must be balanced with that of the safety of the frozen food lading. National Association of Frozen Food Packers, Technical Bulletin No. 1, (July 18, 1946) recommends to members of this organization that "all frozen foods should be at a temperature of 0 deg. F., or below, before being shipped" and "Frozen foods should be loaded only in heavily insulated refrigerator cars which are perfectly tight, clean, and odorless. . . . The inner walls and insulation of a refrigerator car should be thoroughly chilled before it is loaded with frozen foods. Initial icing should be started from 18 to 48 hours prior to loading, the exact number of hours depending on outside temperature. The refrigerator car should be precooled to a temperature of at least 12 deg. F. preferably to 10 deg. F. before being loaded with frozen foods." Recommendations and practices of this kind will lead to improvements.

Bacterial action is negligible in frozen fruits and vegetables when held at temperatures below 15 deg. F. Also, with the exception of fruits in heavy sirup, meltage is not significant in the range of 0 deg. F. to 15 deg. F. It might seem that there is no great harm in using cars that can provide these temperatures because general opinion rates today's reefers as "good enough but not just what the industry desires." The safety factor would be much higher, however, if the reefer would hold the lading at 0 deg. F. The ideal is avoidance of both costly and dangerous rises in temperature from the time the food leaves its warehouse until it reaches a warehouse at the trip's end.

Test No. 9

With such an indifferent rating given to present reefers by frozen food shippers, the railroads are continuing research in an effort to provide better cars. From the results of several test trips made jointly by the Association of American Railroads and the U. S. Department of Agriculture, in 1946, it became evident that insulation studies or heat transmission investigations would be necessary to enable car builders to study refrigeration problems to the best advantage. The Refrigerator Car Research Bureau of A.A.R., USDA and the U. S. Bureau of Standards jointly conducted Test No. 9, completed last October. The American Refrigerator Transit Co., St. Louis, Mo., built six new ART reefers for the use of these investigators. These cars have varying amounts of insulation from 3-3½ in. to 6-7 in. Two of this group of six cars have reflective insulating material. It was arranged to load all six cars with frozen foods at Hillsboro, Ore., for shipment to Cincinnati, O.

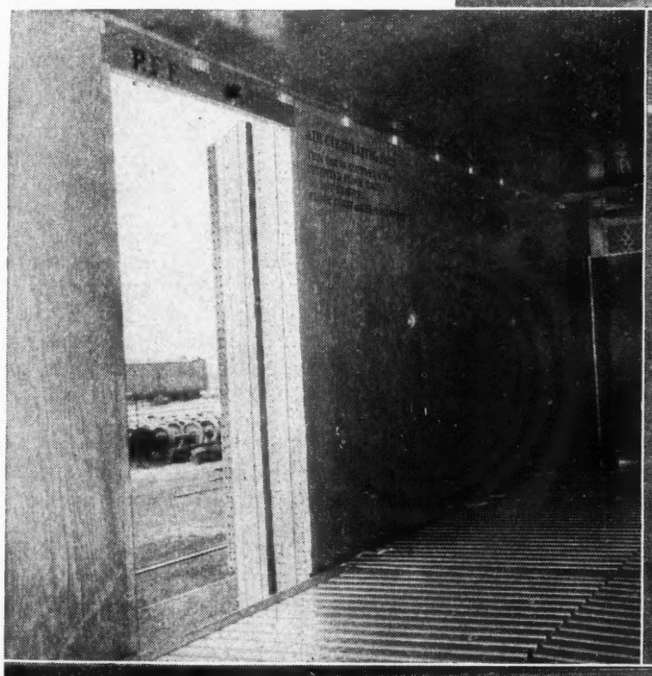
Thermocouples were placed in the superstructure, walls, floors and ceilings, from the exterior to the interior at strategic points, in each car so that transmission of heat could be recorded from origin to destination. The K values of the insulation used were determined through the hot plate method, serving as a heat flow meter. These meters, together with the temperatures recorded on the test trip made possible accurate computation of transmission of heat through the superstructure of the cars.

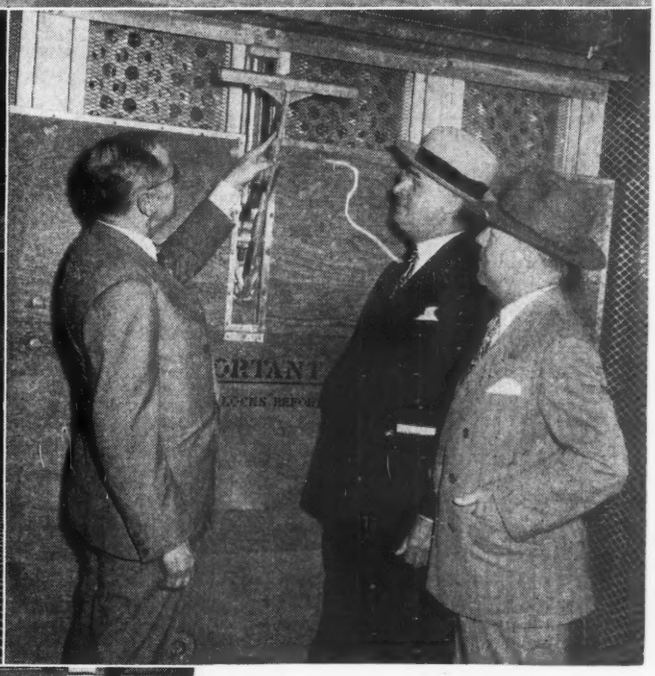
As a balance against these computations, an accurate measurement on the refrigeration input into the car was to be determined through careful record of weights of ice and salt used. This information, together with the specific heat of the materials used in the construction of the inside of the cars and the commodity and packages, was checked against the heat flow computations.

The Chicago & North Western Railway furnished a business car which was attached to these six test reefers. The observation end of the business car was adjacent to the test cars and connected to them

Fig. 9. At right is the Pacific Fruit Express Co's. experimental reefer, sheathed in aluminum alloy and insulated with an extra thickness of a new lightweight material. The car is to be used for testing by PFE's joint owners, Southern and Union Pacific.

Fig. 10. Below are shown the metal herringbone floor racks, set at an angle to provide a better surface for all types of loads. This view was taken in the PFE experimental car, shown at right. Besides insulation the walls have flues for free air circulation.





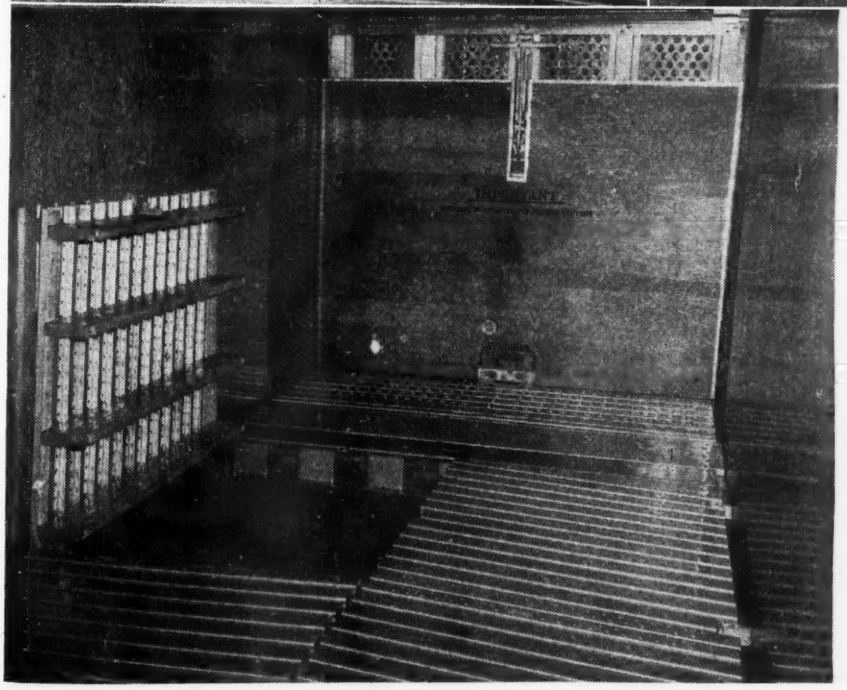


Fig. 11. (Above) The control handle operates the convertible ice bunker in the new experimental aluminum refrigerator car of Pacific Fruit Express. K. V. Plummer, of PFE is showing the device to W. T. Price, of the Union Pacific and G. J. Blech, of Southern Pacific.

Fig. 12. (Left) End view of interior of PFE experimental reefer. A section of the herringbone floor has been raised to show the location of the fans, which blow air through the car from under the convertible ice bunker. Air can flow freely under the floor racks and also through wall flues for more uniform cooling of the lading.

by cables. This permitted the reading of instruments either while the train was moving or standing still. Instruments operated on 115-volt, 60-cycle, a.c. current, connected through a converter to the electricity generated by the business car of 32 volts direct current. These investigators, headed by C. A. Richardson, Chief Engineer of the Refrigerator Car Research Bureau, of the A.A.R., have developed a basis from which an analysis of the different types of insulation can be made.

Thorough Test

Evidence of the thoroughgoing nature of the test is the scale on which it was conducted. The six special reefers carried 450,000 lb. of Birds Eye-Snyder, Inc., frozen fruits and vegetables. The temperature record included some 12,000 readings, taken at 20 points in each of the cars. Special electronic equipment was used for the temperature measurements, devised by the Brown Instrument Co., for making accurate readings possible while the train was in motion.

Test Results

The six cars were subjected to a variety of weather conditions on the test run, as it turned out. A preliminary analysis of the findings showed good temperature performance in all the cars with the advantage in favor of the more heavily insulated construction, as was to be expected. The more lightly insulated cars were at 5 deg. after icing. Load temperature rose to 7½ deg. during the trip. The heavily insulated cars were at 4 deg. after icing, and rose to 5½ deg. enroute.

In addition to such tests, practically all refrigerator car companies are making some improvements on their reefers. The Reynolds Metal Co.'s experimental aluminum reefer, for example, is said to be lower in center of gravity, when iced, larger in cubic capacity because the ice bunker is under the car, better insulated with special panel type insulation and with roof hatches eliminated, well provided with both fan and gravity circulations systems, reduced in weight by 14,000 to 18,000 lb. as compared with other reefers, and provided with swing motion trucks for high speed service.

Comparative Efficiency

On a transcontinental shipment a reefer is in motion only 50 percent of the time and is idle the remainder. It has been suggested, therefore, that the ideal type of car would be a heavily insulated overhead brine tank car equipped with fans. It is pointed out that the fans provide forced convection while the car is in motion and further the heavy insulation would protect the lading while the car is idle. Heat penetration, which is greatest at the tops or the ceilings of reefers, is minimized in these overhead bunker cars even without fans. There is, of course, a hazard from leaking brine from the tanks or from condensation, which might form on the cold air baffles, dripping on the cases.

Frozen food shippers seem to prefer this overhead brine-tank reefer to all other cars now available. Next comes the heavily-insulated fan car and finally the standard end-bunker reefer. While lightly insulated fan cars are not preferable, they can be used on short hauls although the safety factor is not as high in these cars as with those constructed specifically for frozen food transport.

Although temperatures at the foot of bunkers, in end-type cars, might be as low as zero, other parts of the car, especially in front of the doors, will show varying higher temperatures. Air circulation in these reefers is by natural convection which seems insufficient to create free movement of the low temperature air from the foot of the bunkers throughout the load.

Regardless of the scheduled building of new reefers, frozen food packers face a most serious trans-

TABLE II—Heavily Insulated Cars

Ownership	Series	Approx. No. of cars.	Dimensions: Length ft.	Length in.	Width ft.	Width in.	Height ft.	Height in.	Insulation: Walls in.	Ceiling in.	Floor in.
PFE	200001 to 200100		42	6	8	10	6	11	6	7	7
	200101 to 200120		42	6	8	8	7	7½	6	7	6
	200121 to 200125 (Overhead Tanks)		50	1	8	8	6	6	6½	8	8
	200301 to 200375 (Fan Equipped)		38	3	8	8	7	8½	6	7	7
	200379 to 200478 (" ")		38	3	8	8	7	8½	6	7	6
	200376		36	9	8	10	6	7	5½	6	6
	200377		36	7	8	8	6	6½	6½	7	7
	200378		36	4	8	6	6	6	7½	8	8
	296522	304	33	2½	8	3	7	3	6	7	7
ART	35000 to 35049 (Fan Equipped)		33	2½	8	3	7	1½	5½	6	5
BREX	300 to 329	30	42	6	8	6	7	1½	6	6	6
FGE	800 to 822		33	2½	8	0	7	3½	6	6	6
	828 to 899	59	33	2½	8	0	7	3½	6	6	6
FOBX	600 to 609 (O.H. Bunkers)		50	0	8	8	6	8½	6½	8	8
	775 to 799 (" ")		50	0	8	8	6	10½	6½	8	8
	4975 to 4999 (" ")	35	50	0	8	8	6	10½	6½	8	8
GARX	7999		33	2	8	4	7	9	5½	5½	5
	8020 to 8069		32	9	8	4	7	9	5½	6	5
	8100 to 8107		32	9	8	4	7	9	5½	6	6
	8150 to 8169		32	9	8	4	7	9	5½	6	6
	9950 to 9999	105	42	6	8	10	7	10	8	7	8
MAHX	2000 to 2049		32	9	8	4	7	9	5½	6	5
NRC	700 to 799	100	50	0	0	0	0	0	0	0	0
	850 to 899	49	39	10	8	0	6	7½	6½	6½	6
NWX	70000 to 70609	591	50	0	..	..	..	..	....	....	....
	51000 to 51045	100	42	6	8	10	7	4½	4½	6½	5½
RAOX	1041 to 1050		32	9	8	4	7	9	5½	6	5
SFRD	5000 to 5019		40	1½	8	8½	6	6¾	6¼	7½	6
	5020 to 5069		42	1½	8	11	7	7	7	7½	7
	5070 to 5144	70	40	1½	8	8½	6	6¾	6½	7½	7
URT	1000 to 1039		32	9	8	4	7	5	5½	6	5
	24000 to 35099		32	9	8	4	7	5	5½	6	5
	35500 to 35649		32	9	8	4	7	9	5½	6	5
	89000 to 89049	42	42	6	8	10	7	10	8	7	8
WFE	400		42	6	8	8	7	4½	6	6	6
	401		42	6	8	6	7	0½	6	6	6
	402		42	6	8	8	7	4½	6	6	6
	403		42	6	8	6	7	4½	7	8	8
	404 and 405		42	6	8	8	7	4½	7	8	8
	406		42	6	8	6	7	4½	7	8	8
	407 to 414		42	6	8	8	7	4½	7	8	8
	415 to 422		42	6	8	6	7	4½	7	8	8
	423 to 500	99	42	6	8	6	7	4½	6	6	6
M.D.T.	730 to 784	55	40	0	..	..	..	..	....	....	....
	Total No. Cars	1639									

TABLE III—Fan Equipped Cars
(with 3½ to 4½ inches of insulation.)

Ownership	Series	Tank capacity coarse ice	Dimensions: Length ft.	Length in.	Width ft.	Width in.	Height ft.	Height in.
PFE	63501 to 65500	12,200	33	2½	8	3	7	3
	76005 to 76504	12,200	33	2½	8	3	7	3
	97409 to 97413	12,200	33	2½	8	3	7	3
	100401 to 100500	13,400	38	3	9	1½	7	3
BREX	74400 to 74699	10,200	33	2½	8	3	7	4
IC	50300 to 50304	10,800	33	2½	8	3	7	9
MDT	6429 to 6436	11,600	33	2	8	3	7	4
NP	92000 to 92950	11,300	34	6	8	10	6	8
NRC	18000 to 18499	11,400	33	2½	8	3	7	4½
SFRD	4200 to 4248	12,200	33	1½	8	2½	7	9½
	4249	12,200	33	2½	8	2½	7	9½
	4250 to 4750	12,200	33	1½	8	2½	7	9½
	7000 to 7888	12,200	33	1½	8	2½	7	9
	7900 to 8599	12,000	33	1½	8	2½	7	9
	14280 to 15399	12,200	33	1½	8	2½	7	9
	37365 to 37389	13,300	42	1½	9	1½	7	9½
WFE	66400 to 66999	10,200	33	2½	8	3	7	6½

port problem. In the 11 western states there are over 200 frozen food plants, which, in 1945, produced approximately 63 percent of the total U. S. frozen fruit and vegetable pack. Since freezer storage available to packers in this region is insufficient to store all of this production, some of it must be shipped-when-packed.

Car Shortage

Last October there were 1639 heavily insulated cars available to the nation, (Table II) with more than half available to West Coast producers. This indicated a car shortage for the coming year, even though the number could be supplemented, for short hauls, with lighter insulated fan-equipped cars (Table III). Two months later, however, 400 such reefers had been added to the pool, improving the outlook considerably.

The railroads now appear to be only awaiting the full results of the 1946 six car test before beginning further construction of what they term superinsulated cars, embodying the recommendations resulting from this test. In addition, the Railway Express Agency has signed a contract for 500 high speed refrigerator cars. These latter are to be "controlled temperature" cars, which can be adapted to other forms of express merchandise, but which can be used for frozen food shipment at express rates.

Under present construction setbacks, due to strikes and steel shortages, new cars cannot be considered until actually delivered. And even under normal conditions it is unlikely that the reefer supply will ever catch up, much less exceed, frozen food demands.

Fig. 13. Santa Fe's Car No. 13,000 is a general purpose reefer, sheathed with stainless steel and equipped with Preco fans, wall ducts, fiberglass insulation and end bunkers.

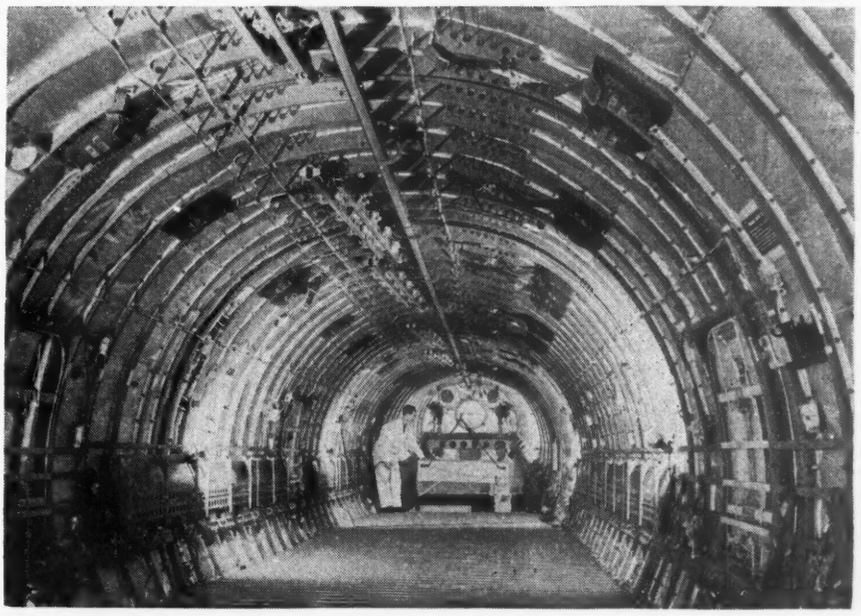


Fig. 14. The Boeing Stratofreighter's upper deck cargo compartment is 74½ ft. long, 6½ ft. high and 8⅓ ft. wide. This is the largest of the ship's four compartments.

Fig. 15. The Boeing Stratofreighter is a double deck, four engine, all-cargo plane with a volume nearly twice that of the average box-car. One such ship will make 20 cross country trips to the car's one. The four compartments can be unloaded simultaneously.

Fig. 16. Refrigerated truck-trailer shipments are a major factor in frozen food distribution. This unit is operated by Pat Liberty between Los Angeles and Nogales, Ariz.

Transportation costs are reflected in the final retail prices of frozen commodities. Shippers naturally prefer to employ the safest, most efficient and economical means of transport. In this respect, the rail reefer offers safe and efficient transportation at a 1946 average cost of 0.8 cents per ton mile on transcontinental hauls. Rail express service, highway refrigerated trucks, reefer ships and air freight, are however, of increasing importance as carriers. The advance in transportation rates for frozen fruits and vegetables, effective January 1, means an increase of approximately 20 percent, thus upping per ton mile costs about 0.1 cents.

Air Transportation

No air freight companies are operating refrigerated planes that offer safe temperatures for frozen foods, although Boeing is now building a refrigerated plane, the Stratofreighter, which will carry a pay load of 41,000 lb. at temperatures as low as 40 deg. at 3.9 cents per mile-ton. Forty-nine of these 350 mile-per-hour planes have been ordered by five major world airlines handling express and freight.

Truck Transport

A major competitive factor which railroads will increasingly face is refrigerated truck and trailer shipment of frozen foods. The early history of frozen food transport by truck was somewhat unpleasant. Truck lines were inadequately equipped with either equipment or experience. Warm cargo was loaded with frozen products. Solid carbon dioxide when used at all was often improperly applied and the transfer or loading of frozen merchandise often occurred unprotected in the hot sun and after long intervals of time. Continued effort and improved equipment have gradually made refrigerated truck transport an important service in many parts of the frozen food industry.

The cost of providing refrigeration in truck transport is dependent upon three factors: (1) The temperature to be maintained, (2) the outdoor temperature and (3) the length of time the refrigerated service is provided. The same amount of refrigeration is required when moving an empty trailer at zero degrees inside as is required when transporting *any quantity* of precooled load at zero, assuming the ambient temperature and the duration of the service are the same in each case. This takes into consideration the fact that there is no heat evolution from the cargo at zero. The cost of refrigerated truck service is therefore figured on an hourly basis, not ton-mile; although, in consideration of total shipping costs, that of moving the equipment is figured on this basis.

In figuring the costs of this service, temperature requirements fall generally into three groups: (1) Zero to 10 deg., for frozen foods, (2) 32 to 45 deg., which fresh fish, meats, fruits, vegetables and dairy products require and (3) 60 to 70 deg. for candy, cosmetics and wax goods. Factors to be considered include interest on the investment, preventive maintenance, periodical overhaul, fuel and dead weight of the mechanism. With the unit operating approximately 100 percent of the time to provide temperatures for group 1, the average cost of group 2 would be 75 percent of group 1 and group 3, 50 percent of group 1.

Almost imperceptibly, the refrigerated truck and trailer have established themselves in the distribution picture. The flexibility of truck transport and the ability to serve smaller markets, making direct packer-to-wholesaler deliveries, have demonstrated its worth. Refrigerated trailers now move frozen foods as far as 1500 miles, maintaining satisfactory temperatures

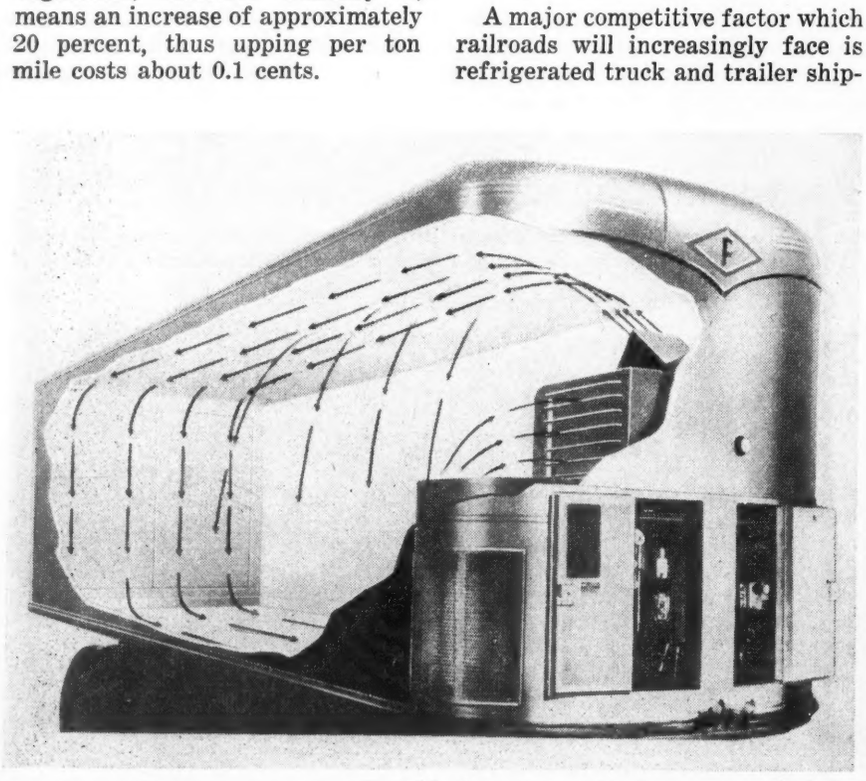


Fig. 17. This diagram shows the air flow in a refrigerated trailer, which is controlled from the cab of the truck. Fans are on either side of the refrigeration equipment at front.

through thermostatic control of built-in refrigerating units. Trailers are being built up to approximately half reefer car capacity, designed for steady maintenance of 0 deg. F. or even lower under special conditions. Insulation against radiant as well as conducted heat shows the influence of wartime need for light weight as well as low K factor. Loading of trailers is accomplished through full rear doors, and body widths and heights are only limited by road requirements while lengths extend up to 35 ft.

Return pay loads are as essential to economical truck operation as they are to reefer cars. Frozen fruits and vegetables may be hauled south on the West Coast and frozen fish move north, while from the Midwest frozen eggs move to east coast with a back haul of frozen fish from New England.

Transcontinental haul of refrigerated trucks and trailers is not yet possible because of limitations imposed by structural features, as well as interstate license and control problems. However, the technical problems to be surmounted for transcontinental refrigerated truck haul of frozen foods do not seem unduly large.

The refrigerated truck as part of a distribution system, centered on a primary freezer warehouse, is a development which few cold storage warehouses have adopted, although some of them have doubtless studied its possibilities. The use of trucks to acquire as well as distribute frozen foods may become a function of a warehouse surrounded by an area which it can supply with merchandise owned by others, or with its own merchandise if the warehouse performs the distributor's functions. For such use, other small types of refrigerated trucks are required.

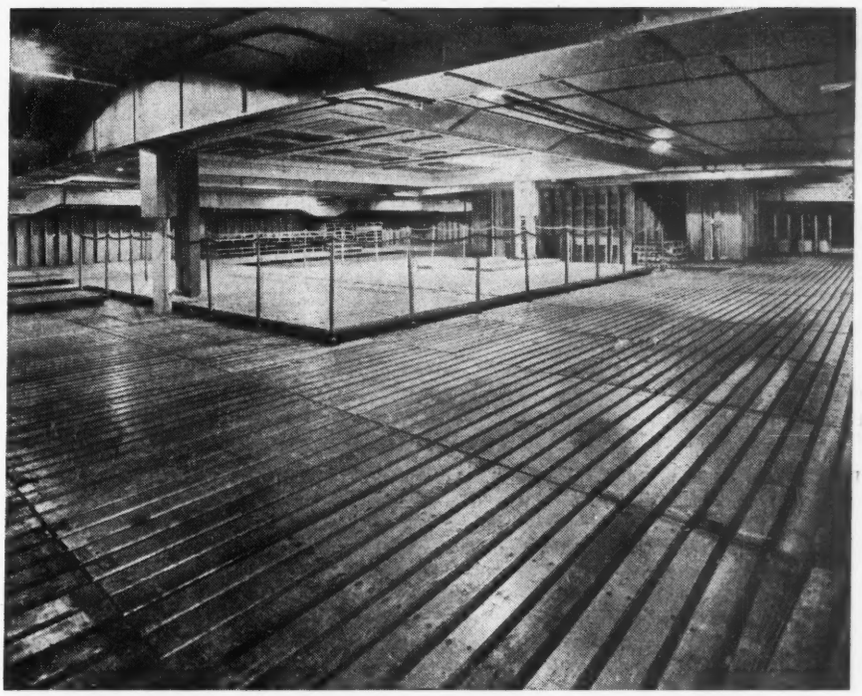


Fig. 18. The newer refrigerated ships are being planned and built with facilities for frozen food storage. This is the refrigerated hold of one of the older vessels.

Refrigerated ships are being planned and built with facilities for frozen food storage. Unfortunately, some conservative designers still cling to the idea that temperatures of 10 deg. to 20 deg. F. are adequate for frozen foods. As late as the war period, ships were still being designed and built with no better than 10 deg. F. storage facilities, and even those temperatures are doubtful of attainment in tropical waters.

Certain major problems of design and operation remain to be studied and improved or altered, notably the type of refrigeration system, the physical problems of stowing large holds with frozen foods, the lack of protective measures during loading or unloading on unrefrigerated pier space, and the supervision and training of personnel.

The large tonnage capacity of refrigerator ships is not an unmixed blessing, so far as the ability of many markets, to absorb such shipments is concerned. Also, in intercoastal shipment, the rate may be attractive for sea coast market delivery but if rail or truck haul inland is necessary much of the savings may be dissipated. Where costs are equal, shipboard temperatures might still prove an incentive to shippers of frozen foods.

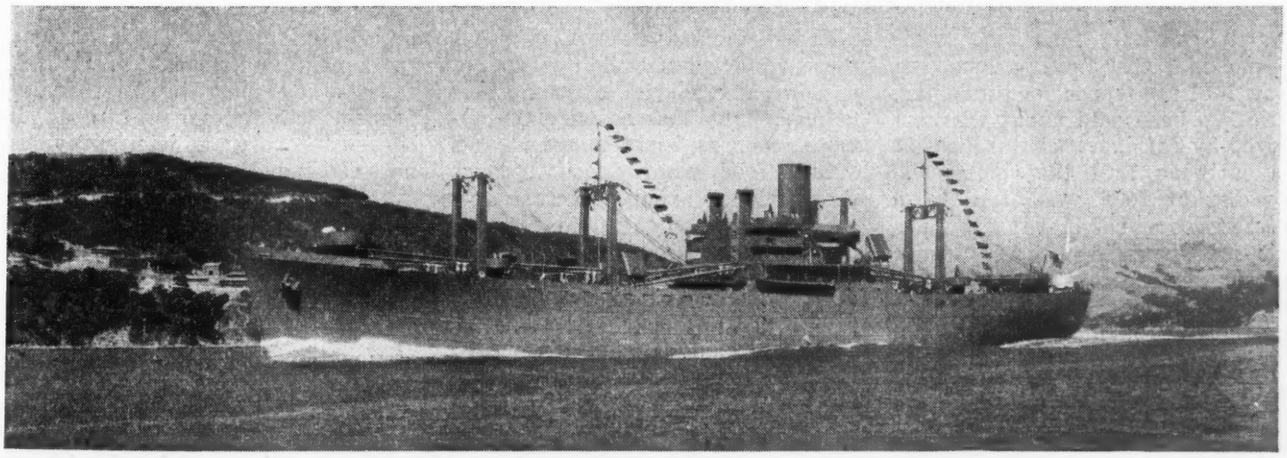


Fig. 19. The S. S. Great Republic, a Maritime Commission ship, is a fully refrigerated freighter. It has 500,000 bd. ft. of Fiberglass in layers of 12 in. on shell side and under main deck. The vessel carried refrigerated food during World War II.

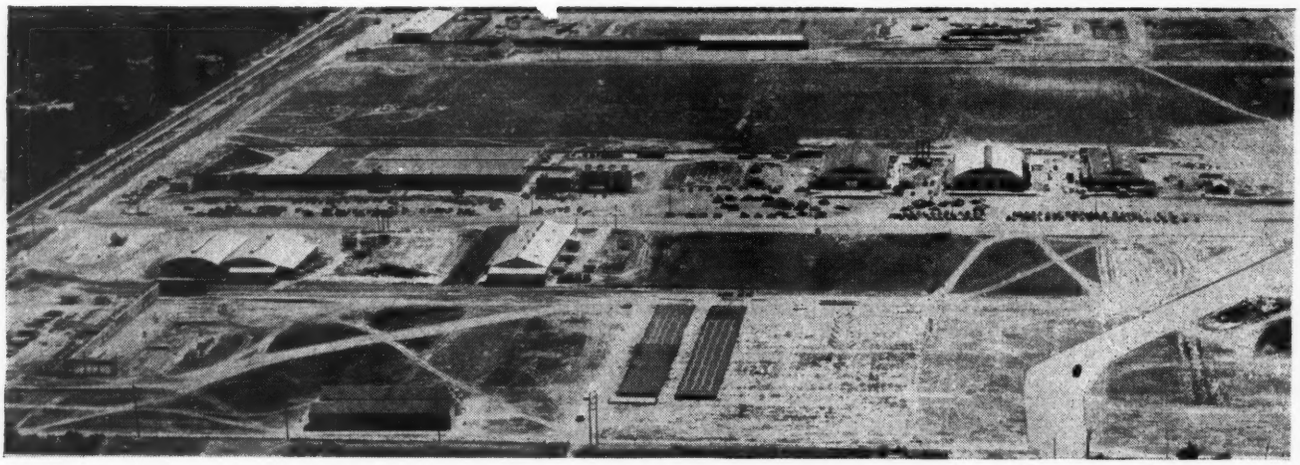


Fig. 20. The Modesto Refrigerating Co., Modesto, Calif, is an outstanding example of the newer type food freezing and freezer storage plant. Built at a cost of $1,250,000, it has 1,000,000 cu. ft. of space, all convertible. Its refrigeration capacity is 800 tons per day, at temperatures as low as —10 deg. F. Quick freezing capacity is to 150 tons per 24 hour day at —35 deg. wind blast.

Frozen Food Report No. 2

WAREHOUSING

Freezer storage must be strategically located and available when needed for effective operation of the frozen food industry. Future production gains may depend upon joint action by processors, warehousemen and distributors

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and

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In the publicity that has accompanied the over-dramatized growth of the frozen food industry, little has been said about the part played by refrigerated warehouses. As early as 1861 the commercial freezing of food was sired by a freezer room, refrigerated by ice-salt mixtures, in a cold storage warehouse. Since that time, and especially during the last 20 years, the frozen food industry could not have expanded its production or marketed its products if it had not been for freezer storages located in production regions and in metropolitan markets and at strategically located transit points.

Unlike the industries they serve, these windowless buildings do not possess any special attraction or glamor. They lack entirely the dynamic color and motion found in a frozen food plant. And, because they excite no popular interest, only those actually engaged in the production and distribution of cold storage commodities are aware of what is actually involved in good cold storage service. It is a highly technical business and requires a large investment for equipment and insulated space to safeguard perishable goods.

Freezer storage is just as important to the frozen food industry as processing plants. There is one fundamental essential of frozen foods—they must be kept under proper freezing temperature at all times. The process itself provides no continued preservation and even the moisture-vapor proof packages in which the food is contained would protect it but a fleeting hour or so outside of freezer storage.

Contrary to the popular impression of the speed with which frozen foods are conveyed from packer to dinner table, they are actually processed for subsequent freezer storage so that they may be distributed according to consumer demand dur-

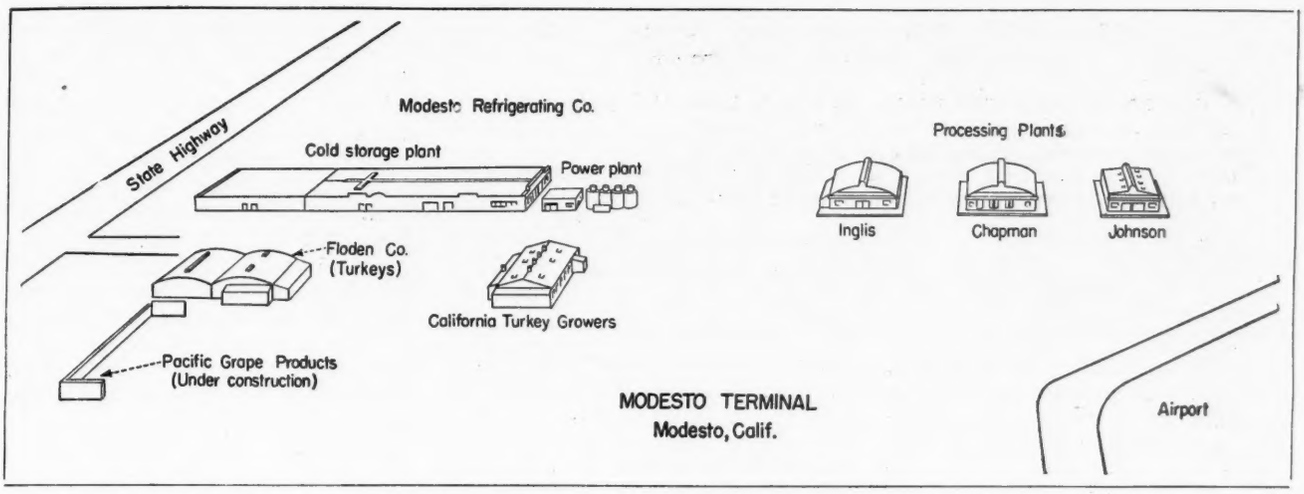


Fig. 21. This outline drawing of the Modesto layout illustrates the development plan now in operation. The three frozen food plants, at upper right, prepare the foods for processing, after which the reefer plant handles the actual freezing, storage and shipping of the finished product. This central freezing and storage is ideal for efficient handling of frozen food.

ing the out-of-season months. Peas that are frozen during June-July may not be consumed until May of the following year and during this ten-month interim they must be kept in proper freezer storage. The rate of speed in freezing is not the sole guardian of quality in frozen foods. The conditions of subsequent transport and storage may have much more to do with the retention of desirable food properties and characteristics than quick freezing. Rapid freezing is important and, of course, essential, but the quality of frozen food when it reaches the hands of the ultimate user can be entirely different from its quality when it left the packers' custody. Color, texture, flavor and appearance can all be easily damaged through carelessness in storage or transport and by lack of technical knowledge or skill in maintaining the desired protective environment.

Quality Retention

By using good raw materials and modern processing technics the packer can produce a quality product, which is usually sold under a proprietary brand. Under carefully controlled temperature and humidity and in protective packages, freezer storage will retain this condition of quality, delivering it for use in its original state. Although the packer may own the brand, he no longer has personal custody over his products after they have been shipped from their original storage. Quality is the best protection for a brand of food and quality retention is the responsibility of the refrigerated warehouse while it is in freezer storage.

An expanding frozen food industry means an equally expanded freezer storage industry. Uncertainty as to storage space is a problem to be added to the already existing bottlenecks of refrigerated transport and retail-consumer low temperature cabinets. Frozen food packers must have sufficient freezer storage space for their growing production volume in producing regions and also enough freezer space strategically located in relation to the major markets.

This storage problem originates in producing regions where frozen foods must be stored in freezer temperatures immediately after they have been frozen. During the past eight years, in which the industry experienced its greatest expansion, freezer storage became increasingly congested during the packing season. The ending of the war, with its peculiar market conditions induced by rationing and pricing procedures, did not have any material effect on these abnormal and especially intermittent cold storage space crises, which are sometimes only regionally acute. In the latter part of July and in August (1946) this situation became critical, despite the fact that USDA reported an 18 percent increase in public storage space from 1944 to August, 1946. In order to understand this condition, it is necessary to study the factors that caused it.

SOURCES

Information presented in this section is drawn largely from the F.I.—T.R.R.F. 1946 Frozen Food Survey and represents data collected by questionnaires from cold storage warehouses in which 55 percent of the nation's freezer storage space is contained.

Other information, secured from USDA, utilizes data covering all refrigerated storage in the United States.

War's Impact

Wars create industrial abnormalities. When this country chose to be the larder as well as the arsenal of the Allies, the effects upon cold storage warehouse space, both cooler and freezer, was a considerable one. Stockpiling for military or strategic feeding strained warehouse facilities and could not, of course, have any regard for normally expected peak occupancy periods or for space needs for storage and marketing of current packs of frozen foods. As a result, in some instances, a uniform condition of freezer storage congestion, without even momentary relief, created a difficult problem. This was especially true where seasonal production coincided with military demands for storage, as in the coastal areas of the country. Without exception, every commodity requiring freezer storage soared in production during the war (Table IV).

With the advent of war came the cry for all-out production of all foodstuffs. But, because our agricultural and other raw food producing sources were not able to gear for high production on such short notice and because of other unstable economic factors developed by the war, all-out production of freezer commodities did not materialize until May-June of 1943 (Chart V). However, concurrently with this increased production, cold storage and freezer space of all kinds was expanded. So, consideration of this chart must be weighed

F.I.—T.R.R.F. 1946 Frozen Food Survey
Warehouse Freezing Facilities

Question: Do you provide freezing facilities to frozen food packers?
(a) What are your charges per ton for freezing foods?
(b) Do you provide handling labor for freezing foods?
(c) Do your charges for freezing foods include first month storage costs?
(d) At what temperature is your quick freezing done?

Freezing Facilities Provided		Handling Labor Provided		Monthly Charges for Freezing Foods With 1st Mon. Storage		Without 1st Mon. Storage		Quick Freezing Temp.
Yes	No	Yes	No	High	Low	High	Low	(deg. F.)
61.5%	38.5%	74%	26%	$30.00	$5.00	$20.00	$1.50	−10 to −57

with the fact that, even though it does not indicate an increase in available space, space did actually increase along with production. Yet, because of the frozen fruit and vegetable industry's success in doubling production during the years 1942 to 1945, additional freezer space was filled almost as rapidly as it could be built or converted from cold storage.

A comparison of the curve for freezer storage holdings of fruits and vegetables with that of total holdings in freezer storage, shows that these commodities have accounted for approximately 30 percent of the total space occupied (Chart V), with a trend toward even greater occupancy as the industry expands its production. In recent months, these commodities have accounted for over 40 percent of total freezer occupancy.

Occupancy peaks and subsequent out-movement of freezer commodities appear to occur with uniformity on this chart until late 1943 when available space was difficult to find. During 1944, space remained relatively tight, and a return to a normal condition (when the low percentage of occupancy during May-June-July is around 60 percent) did not occur until 1945). Freezer occupancy for 1946 remained steadily around 80 percent until August when congestion became critical. The seriousness of this congestion is reflected even more emphatically in the lack of out-movement of some frozen fruits. It would be misleading to tag all residual storage of frozen fruits and vegetables from the 1945 peak as a "carry-over." There is no other term to use, however, for the large residual supplies of apples, apricots and peaches, which amounted to:

Apples .....23,252,000 lb.*
Apricots .....18,906,000 lb.*
Peaches .....36,111,000 lb.*

* Method employed for working out these carry-over figures is explained on Vol. p. 5, this issue.

If it can be assumed that the low point of storage occupancy for a product, which occurs just before the month in which the packing season begins, represents an approximate residual quantity (in pounds) that was not consumed from the pack of the previous year, then such holdings of fruits from the 1945 pack would be 205,454,000 lb. This is 47.7 percent of the total 1945 fruit pack of 430,176,545 lb. The heavy carry-over of apples, apricots and peaches represents 38 percent of this residual storage holding of fruit. Because of the long growing and packing season for vegetables, June to December, it is impossible to select an optimum date on which to show residual holdings of all products. However, just prior to their packing months, four of the most popular items showed freezer holdings as follows:

Beans, lima ..... 2,959,000 lb.
Beans, snap ..... 7,628,000 lb.
Corn, cut ..... 5,802,000 lb.
Peas .....18,521,000 lb.

It requires two to three months to freeze and transport products to markets and it is desirable that a reasonable residuum of the pack of each commodity remain in storage when the next year's pack begins. It is, of course, impossible for packers to gage their packs so that the market is clear of all products when the new year's pack arrives. As a matter of good business, it is necessary to keep an ample supply of all kinds of frozen foods to satisfy

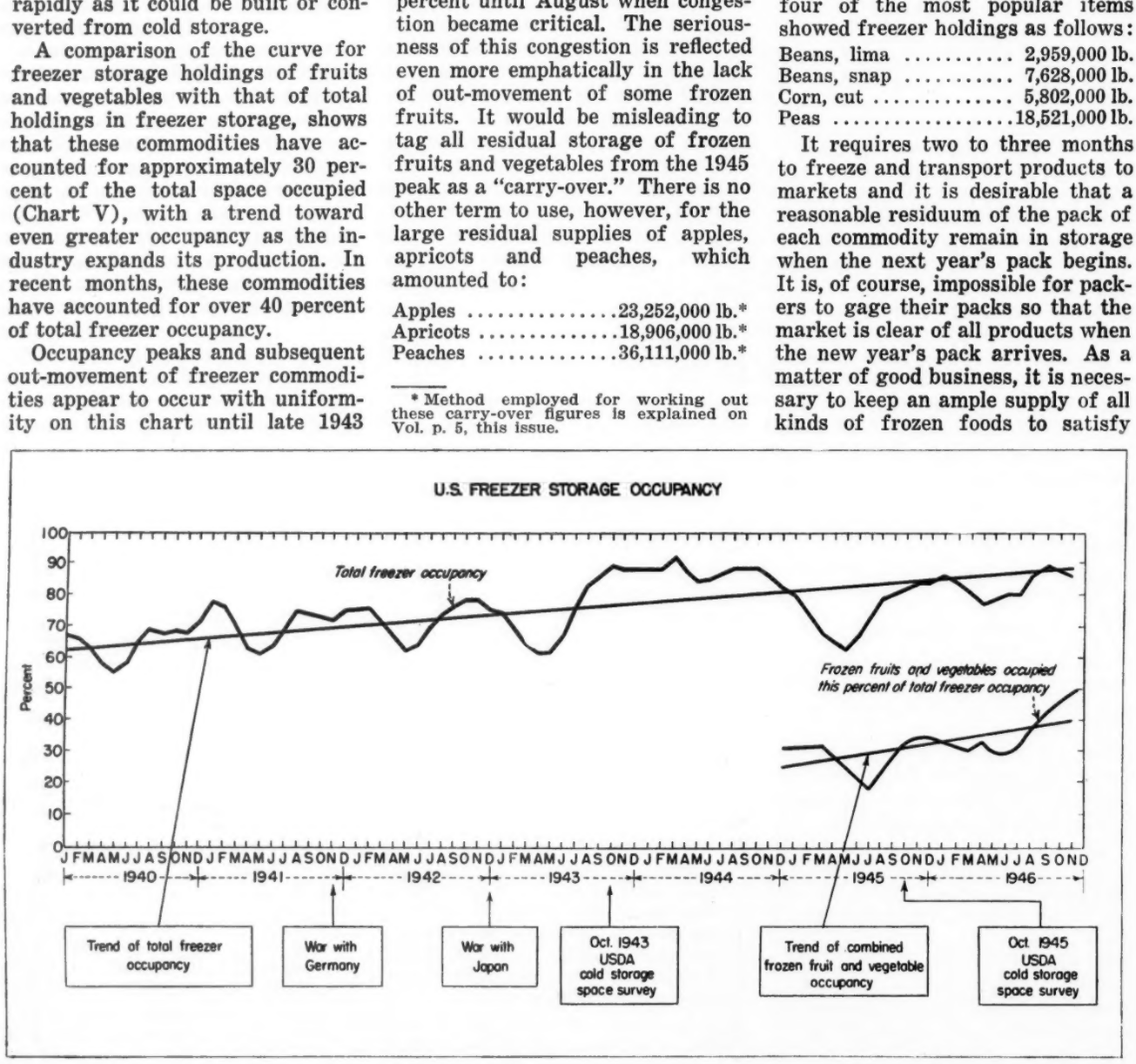

U.S. FREEZER STORAGE OCCUPANCY
Percent
100
90
80
70
60
50
40
30
20
10
0
Total freezer occupancy
Frozen fruits and vegetables occupied this percent of total freezer occupancy
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1940
1941
1942
1943
1944
1945
1946
Trend of total freezer occupancy
War with Germany
War with Japan
Oct. 1943 USDA cold storage space survey
Trend of combined frozen fruit and vegetable occupancy
Oct. 1945 USDA cold storage space survey

CHART V. This combined chart, based on USDA cold storage reports for 1940 through 1946, gives a comprehensive picture of the percentage of total freezer occupancy during the war years, as well as the trend of frozen fruit and vegetable occupancy.

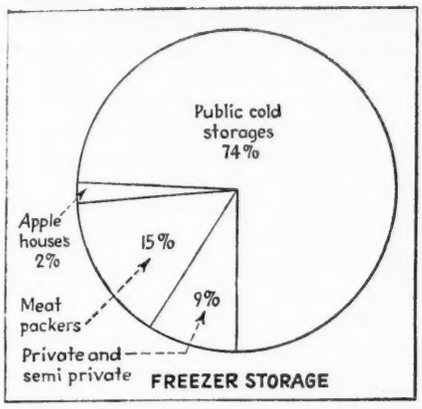


CHART VI. This chart is from USDA's October, 1945, cold storage survey.

demand. An analysis of past years' residual freezer storage holdings of fruits and vegetables (Table V) indicates that the holdings of fruits are more than four times greater than those of vegetables. Why the industry produces this residual tonnage, which remains in storage when the new pack begins, is not so important to warehousemen as its result. If such is good economic practice for buyers of these commodities and for the frozen food industry, frozen fruits would seem to be more uniform annual occupants of freezer storage than vegetables.

From the standpoint of quality retention and the economic operation of the frozen food industry, this uniform heavy residual storage of fruits seems contrary to good practice. The frozen pack of one year should be sold as completely as possible during the following year. Not only is this complete turnover of the annual pack good business, but it also makes room for the current pack in freezer storage. And, if the public warehouse industry is to operate on a profitable basis, there must never be an excessive amount of unoccupied freezer space. In addition to the economics involved, this clearing of the preceding year's stocks is desirable because frozen fruits and vegetables will slowly lose prime quality if held, even under the best of conditions, for too long a time.

Marketwise, such carry-overs present serious aspects in that they occupy freezer storage which might have been open to other products that are favored with stronger consumer demand than the products comprising the residual storage.

As the current packing season data began to indicate the size of the 1946 production, there were factors that pointed towards another surprisingly large pack. Among fruits and vegetables from the 1946 pack, the most important in relation to storage holdings as of September 1 were 138,959,000 lb. of peas and 64,677,000 lb. of strawberries. These holdings represent an increase over September 1 of last year of 55 percent more peas, 74 percent more strawberries. When these large increases in current production are added to the 1945 carry-over, the whole picture of the cause of storage congestion last August is quite clear.

Coordination Sought

Packers of frozen foodstuffs must take into consideration that, even though warehousemen are acutely aware that production of frozen foods is bursting the seams of all freezer storages, they cannot cope with unexpectedly large carry-overs and simultaneously make room for unexpected increases in current production. Expansion of freezer storage has been in progress for some time (Table VI) but, in the face of shortages of equipment and material, combined with the unsettled labor situation, it would be difficult, if not impossible, to keep pace with the current demand for freezer space. Because the frozen food and refrigerated warehouse industries have not closely integrated their programs, there has been no opportunity for the correlated planning which should help to alleviate critical shortages of freezer space. This situation may be improved, however, by a recent action on the part of the National Association of Refrigerated Warehouses, which is undertaking a program of closer coordination with other branches of the industry.

Storage Gains

The USDA's "Survey of Refrigerated Warehouse Space" (October, 1943) was made at a time when frozen fruits and vegetable packers were finishing the largest proportion of their season's pack. It

TABLE IV—U. S. Frozen Foods Production
(millions of pounds)

Year	Fruits and vegetables	Seafood	Eviscerated poultry	Eggs	Meat	Cooked foods
1939	143*	183	20	177	2,928	....
1940	256*	196	26	190	3,397	....
1941	315*	247	31	237	3,623	....
1942	384*	247	59	258	4,852	....
1943	395	246	96	413	5,269	13
1944	561	267	79	512	6,111	20**
1945	738	286	113	375	.....	35**

* Combined fruit and vegetable pack figures from *Western Canner & Packer*.
** Frozen Cooked Foods 1944–45 estimates from National Assn. Frozen Food Packers.
Other combined fruit and vegetable figures from National Assn. of Frozen Food Packers.
Frozen Seafoods pack figures from Div. of Commercial Fisheries and Fish and Wild Life Service.
Frozen Eviscerated Poultry pack figures from Institute of American Poultry Industries. Figures not available on all kinds of frozen poultry production.
Frozen Egg figures from USDA, BEA.
Estimates of Frozen Meat Production figures (1939–1944) from R. C. Newton, Vice Pres. Swift and Co
Frozen Cooked Foods 1943 figures from OPA.

TABLE V—Residuum of Frozen Fruit and Vegetable Pack Held in Freezer Storage When Subsequent Year's Pack Began

Residuum reported in..... for the year's pack of.....	1946 for 1945 (percent)	1945 for 1944 (percent)	1944 for 1943 (percent)	1943 for 1942 (percent)	1940 for 1939 (percent)	Average all years (percent)
Total fruits	47.7	36.0	53.2	34.8	46.6	43.7
Selected vegetables*	11.4	7.5	11.5	8.8	....	9.8

* Selected Vegetables: Lima beans, Snap beans, Corn (cut), and Peas.

TABLE VI—Expansion of Freezer Storage Space in Public Cold Storage Houses (Apple Houses Excluded)

Comparison Dates: June 1941, Oct. 1943 and Oct. 1945

(thousand cubic feet)

Region	Freezer net piling space 1941	Freezer net piling space 1943	Percent increase '43 over '41	Freezer net piling space 1945	Percent increase or decrease '45 over '43
New England	5,003	5,390	+07.7	6,213	+15.3
Middle Atlantic	24,735	27,791	+12.4	30,681	+10.5
E. N. Central	21,219	24,151	+13.9	28,482	+18.0
W. N. Central	14,798	15,104	+02.0	16,379	+08.4
South Atlantic	4,457	6,214	+39.4	5,780	−07.5
E. S. Central	1,897	2,219	+11.1	4,037	+82.0
W. S. Central	3,361	4,098	+21.9	5,607	+37.0
Mountain	1,445	1,952	+35.0	2,602	+33.3
Pacific	14,072	15,552	+10.5	19,807	+28.0
U. S. Total	90,987	102,471	12.6	122,588	19.6

Source: USDA Cold Storage Space Report, Dec. 1, 1943 (June 16, 1941);
USDA Space Surveys of June 16, 1941, Oct. 1, 1943, and Oct., 1945.

F.I.—T.R.R.F. 1946 Frozen Food Survey
New Freezer Space

Question: Do you plan on constructing additional new freezer space or converting cold storage space to freezer space in the immediate future? If so, how much new space?

% of Total Answering	% Constructing New Space	% Converting C. S. to Freezer Space	Total amount, cu. ft. to New Freezer Space
70%	19%	35%	3,128,410 cu. ft.

shows that, as of October 1, 1943, there was a total of 102,471,000 cu.ft. of net piling freezer space in public warehouses (excluding apple houses). This represents an expansion of 12.1 percent for the period June 16, 1941, to October 1, 1943. At the end of the next two-year period, October, 1943 to October, 1945, the U. S. freezer net piling space capacity of public warehouses (excluding apple houses) was 122,588,000 cu.ft., or an overall gain of 19.6 percent. Table VI shows this expansion by regions.

In addition to this overall increase in space, from the time the U. S. entered the war up to Oct. 1, 1943, an intensive program for using all available space made possible the storage of 69 percent more commodities, on a weight basis, than were stored on an average during the five years prior to the war. Later this was increased to an even higher percentage of space utilization. But even this did not obviate congestion in freezer storage space during the packing seasons for fruits and vegetables.

Regional Space

The problem of finding a first-home for frozen foods as soon as they have been packed is of obvious importance. Freezer storage congestion of a critical nature seems to occur largely during the frozen fruit and vegetable season (August to December) and prior to the significant out-movement to users, which begins in January. This is not surprising because a breakdown of 1945 packing regions shows that 25 states produce 91.5 percent of all frozen fruits and vegetables in the U. S. (Table VII). Located in these same states is 71.6 percent of all public freezer net piling space (apple houses excluded) and 30.7 percent of other kinds of similar freezer space (private, semi-private and meat). The greater number of major metropolitan markets of the nation are located in these 25 states. These markets account for nearly 60,000,000 or 46.4 percent of the total U. S. population and more than $10,000,000,000 or 53.7 percent of the total estimated food sales in the U. S. (See FOOD INDUSTRIES *Frozen Food Distributional Facilities* and *Frozen Food Marketing Areas** maps and tabulations.)

A concrete example of these complex problems is seen in the west where frozen fruit and vegetable packers accounted for over 63 percent of the total 1945 U. S. pack and yet, in the states where this pack was processed (Oregon, Washington, California, Idaho, Utah and Colorado), there is only slightly more than 10 percent of the nation's net piling freezer space. Although these commodities represent only 30 percent of the country's total occupancy of freezer space, this pack probably accounts for a large share of the total freezer occupany of this region because of the agricultural economy and other factors accounting for fruit and vegetable production storage in the west. October, 1946 found this western space reported as averaging 91 percent full and frozen food packers would be unable to store the pack planned for later months unless some appreciable out-movement took place.

This congestion in freezer space existed in the west even though the USDA Cold Storage Report (October, 1945) stated that ". . . the heaviest construction of new space in public general warehouses occurred in the Pacific region . . ." in the period from October, 1943, to October, 1945. The report adds: "The greatest gains in private and semi-private warehouses took place in the Pacific region, where a number of expansions were made and, in addition, several new warehouses were built as adjuncts to frozen food processing plants."

Of the several other factors contributing to congestion of western freezer space, those that seem most important are: (1) The obligation assumed by packers to store merchandise for buyers for the first month free of charge and (2) the impossibility of quickly moving that part of the pack destined for shipment away from this region, due to the present refrigerated rail car situation. So it accumulates in storage. It is also conceivable that eastern buyers might not be able to find a home for their merchandise and would instruct the packer to hold it in the west until ordered out. It is also necessary for some packers to hold early season items in storage until late season items are harvested and processed so that full carloads may be shipped to buyers.

Other Regions

Although some regions, besides the west, were experiencing their problems in obtaining sufficient freezer space, still others invite study by warehousemen, especially in Texas and parts of the Southwest where large potential freezing production exists. The western situation, however, has been tight consistently, especially in certain areas. Accordingly, either packers or warehousemen should make an immediate analysis of the need for new construction in this area, so that essential new construction or conversion can begin as soon as materials are freely available.

Because of the seasonability of frozen fruit and vegetable occupancy in agricultural regions, it seems doubtful that public warehousemen will be interested in constructing new or expanding old warehouses to satisfy completely the demand for more space. Unfortunately, most frozen food packing operations do not create, at point of production, a strong, uniform, sustaining business for warehouses the year round, as do wholesale distributors of frozen commodities. For this reason it seems that warehouse space in markets will probably expand more rapidly than that in growing and

FRUITS AND VEGETABLES

It is recognized that the refrigerated warehousing industry handles many commodities other than frozen fruits and vegetables. Lack of adequate industrial statistics, however, even on such staples as frozen meat and poultry products, makes an integrated analysis of the entire frozen food industry impractical. Examples, therefore, have been taken from frozen fruit and vegetable statistics to point up typical evaluations from which the reader may appraise the position of other frozen commodities in this industry.

* The information on marketing areas, including colored map and tables, will appear in the February issue of Food Industries.

packing areas. Storage in transit, however, will undoubtedly be given further consideration as the need becomes more and more evident.

Additional Warehouses

Packers and warehousemen must solve the question as to whether the characteristically seasonal occupancy of freezer storages in production areas is attractive to capital for warehouse building. In California, frozen fruits and vegetable packing as well as frozen turkey and poultry production provides practically a year-round season of production but, even in that state, the major tonnages come in the summer and early fall months. Such plants would have a high occupancy for only a few months in areas where only agricultural production exists.

In the interim, while this question is being solved, warehousemen on the Pacific Coast must consider whether they are concerned with the action entertained by a number of progressive packers who plan to build their own freezer storages. The warehouse industry cannot afford to let undue conservatism prevent it from at least being keenly aware that the function of the warehouse may be changing in relation to changing conditions in the country, notably in the field of food processing and distribution.

The reasons packers are building freezer storages are:

1. The service now rendered by refrigerated warehouses does not conform to the daily needs and procedure of the packer. The same comment is made by some wholesale distributors. Warehouses attempt to meet packer needs insofar as labor and other factors permit. The fact is merely that the relationship is not mutually satisfactory in all cases.

2. The economics controlling the free expansion of the frozen food industry into mass production and mass marketing emphasize the need for lower costs for storage, transportation and distribution, as well as lower production costs. Frozen foods are moving out of the early industry honeymoon period and must compete with other processed foods on as nearly equal price bases as possible. They must also contemplate the competition arising in the prepackaged fresh food development, which will doubtless increase as the required refrigeration facilities and other technical essentials are provided on a competitive basis.

3. Packers and distributors (or users) who do not operate their own freezer storages frequently find it necessary to move their merchandise into public storage houses. From the first storage house it is shipped to the buyer and, at point of destination, is again put into public storage. Besides the monthly rate, this incurs two in-and-out charges, all of which contribute to increasing the final retail price on merchandise. Distributors, some of whom now operate their own freezer storage, are anticipating the time when packers will own sufficient private freezer storage and will store frozen food for their customers at lower rates than are now available in public warehouses. Shipment to buyers would then be made direct from packer's storage to buyer's warehouse with only the labor charges involved in the in-and-out movement, storage, and transportation of the merchandise.

These enthusiasts reason, and present data to support their contention, that the packer could well afford to charge himself rates lower than those now available in public warehouses and still amortize the cost of the storage plant in ten to twenty years, even if it were operated only on a cost basis and earning a profit only on the sale of frozen foods. They point out that the smaller packer would no longer have to fear the contractual power or favor gained from public warehouses by the larger packers. And, since the cumulative charges for public freezer storages are reflected in the retail price of the packer's goods, they reason that the latter, owning his own storage, would be able to meet competitive brands on an equal or lower price level. There is also the matter of having personal custody and opportunity for personal inspection of the merchandise. It must be recognized, however, that "short-lived" storage in public warehouses is likely to involve higher rates.

TABLE VII—1945 Frozen Fruit and Vegetable Production and Freezer Net Piling Space Available in 25 Selected States

Item	States: Wash. Ore.	Calif.	Ohio-Ind. Wis.-Mich. Minn.	N.Y.-N.J.-Pa. Del.-Md. Maine	Mo.-Ark.-La. Ga.-Tex.-Ala. Miss.-Tenn.	Colo. Utah Idaho	(000 pounds) Total for States	Total U. S. 1945	Percent of Total U. S.
Vegetables:									
Asparagus	7,275	5,162	.....	7,378	.....	.....	19,815	20,638	.....
Beans, gr. & wax	8,084	1,777	58	16,666	.....	.....	26,585	31,460	.....
Beans, lima	138	10,330	1,608	15,000	.....	.....	27,076	28,476	.....
Broccoli	2,474	8,467	.....	714	.....	.....	11,655	11,656	.....
Brus. sprouts	260	5,995	.....	351	.....	.....	6,606	6,606	.....
Carrots	2,056	2,680	269	792*	.....	.....	5,797	6,051	.....
Cauliflower	3,889	2,780	.....	702*	.....	.....	7,371	7,391	.....
Corn, cut	10,280	.....	7,845	4,128	.....	.....	22,253	25,551	.....
Peas	53,464	.....	15,519	12,590	.....	.....	81,573	103,834	.....
Peas & carrots	2,875	.....	.....	2,421*	.....	.....	5,296	5,332	.....
Rhubarb	3,724	1,721	430	335*	.....	.....	6,210	6,852	.....
Spinach	4,981	8,435	.....	18,672	.....	.....	32,088	36,721	.....
Pumpkin-Squash	4,693	1,171	.....	309	.....	.....	6,173	7,354	.....
Total	104,193	48,518	25,729	80,058	.....	.....	258,498	297,922	86.5
Fruits:									
Berries:									
Black	16,123	283	999	24	4,074	.....	21,503	21,503	.....
Blue	77	.....	3,905	3,843	3	.....	7,828	7,829	.....
Boysen	3,484	2,286	1,000	.....	314	.....	7,084	7,084	.....
Goose	1,524	.....	33	1	.....	.....	1,558	1,558	.....
Logan	2,054	468	.....	.....	.....	.....	2,522	2,522	.....
Blk. Rasp	1,379	.....	1,120	387	.....	.....	2,886	3,477	.....
Red Rasp	11,954	56	923	298	.....	.....	13,231	13,254	.....
Straw	18,530†	970†	1,869	1,251	13,770*	.....	36,390	36,917	.....
Young	1,006	1,540	.....	.....	.....	.....	2,546	2,551	.....
Cherries RSP	1,870	.....	4,180	7,685	.....	1,275	15,010	16,144	.....
Currants	1,072	.....	406	1,190	.....	.....	2,668	2,668	.....
Apples & sauce	21,573	45,000	8,885	10,916	.....	3,961	90,335	92,985	.....
Apricots	11,227	51,294	.....	.....	.....	2,637	65,158	65,158	.....
Peaches	18,567	51,774	6,778	4,813	9,950	3,988	95,870	103,634	.....
Prunes	17,390	.....	.....	.....	.....	.....	17,390	18,368	.....
Total	127,830	153,671	30,098	30,408	28,111	11,861	381,979	395,652	96.5
Combined Total	232,023	202,189	55,827	113,466	28,111	11,861	640,477	693,574	91.5
Freezer Net Piling Space (000 cu. ft.):									
Public Whses	10,698	9,109	15,577	32,304	15,556	2,380	85,624	119,588	71.6
Semi-private, Private, and Meat	3,398	493	2,669	4,163	3,061	989	14,773	39,110	30.7
Total	.....	.....	.....	.....	.....	.....	100,397	158,698	.....

* Indicates that, although the largest portion of this pack was produced by the states mentioned in the column, another state or states' production might be included in order to avoid disclosure.

† Indicates that the pack of strawberries, as given by Western Assn. of Frozen Food Packers (San Francisco) was deducted from National Assn. Frozen Food Packers' combined figures for Ore., Wash. and Calif. in order that this pack could be shown for Ore. and Wash. separately from that of Calif.

Sources: National Association of Frozen Food Packers, Washington, D. C. Western Frozen Food Packers Assn., San Francisco, Calif. USDA Cold Storage Reports.

(Above production states shown on Map No. 1 by green cross-hatch.)

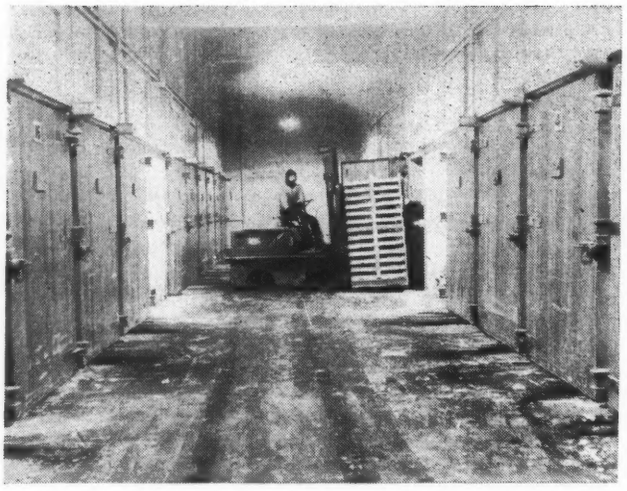


Fig. 22. The freezer tunnels at Modesto are 17 ft. long, 7 ft. high and 4½ ft. wide. Pallet loads are easily handled.

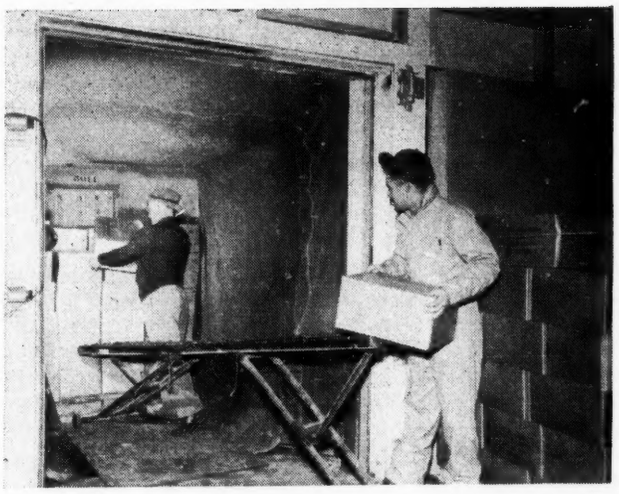


Fig. 23. Mobile tunnels connecting rail cars with refrigerated corridors retain low temperature while loading, at Modesto.

Those proposing this packer-distributor entrance into freezer storage warehousing should consider that all private and semi-private plants operating freezer storages account for only nine percent of the total of all kinds of freezer storage in the country (Chart VI). When this percentage is correlated with the fact that frozen fruits and vegetables now account for about 30 percent of total freezer occupancy, it is evident that the greatest proportion of these commodities is now stored in public freezer space. The frozen fruit and vegetable industry depends upon public warehouses to store most of the pack, so it seems reasonable that, for the time being, frozen food packers should integrate their production output and their own freezer storage construction as closely as possible with the warehouse industry's plans and ability to expand freezer space.

Time to Expand

Demand for frozen food is high and money is available to buy it. This seems to be the long awaited opportunity to expand into mass production and distribution with a resulting reduction in costs that will make frozen foods more competitive with others. In view of the potential opportunity for expansion now open to the frozen food industry, it would seem unwise for it to tie up capital in a program of freezer storage construction unless such is imperative to the needs of the industry or individual company. If the public warehouse industry will expand freezer space along with conservative growth of frozen food production, it would seem that packers will have to build only a relatively small amount of storage space.

Because the profit element must be considered, it is possible that the warehouse industry will be forced to restrict the modernization of plants and the construction of new freezer space within certain limits. On the other hand, because frozen food production output creates a problem of seasonal occupancy, which may be the main factor limiting the expansion of public freezer space, packers and distributors might find it necessary to construct freezer space to accommodate that part of their merchandise that is unprofitable for public warehouses to handle.

Joint Study

Wherever it is found expedient to follow this course, it would seem that the packer, warehouseman and distributor should make a joint study of the problem involved. A careful analysis of the study would probably determine which of these three should provide this freezer storage space, its size, and where it should be located.

At present the cost of storing frozen merchandise in public storage is less important than the finding of space. But, warehouse operators, functioning collectively, should not delay a study of costs and charges for storage of freezer commodities in relation to value, density and storage requirements. Such evaluations are needed to create as completely sound and logical a rate structure as can be developed. Work has been done on this subject in some areas, but due to the complex nature of the subject, the task is not easy.

The expansion of public warehouses in metropolitan market areas presents serious problems. In these congested areas, warehousemen have found it difficult to expand existing plants because there is little or no space available for this purpose. The matter of acquiring new acreage on which to construct freezer storage also presents current problems of inflated costs and desirable locations.

Just what the response will be from the cold storage industry to the continuing "tight" storage situation cannot be predicted with accuracy. Since the warehousing business is no more philanthropic than any other, it seems doubtful that warehouse capital will be expanded for developing freezer storages in production areas for only part season occupancy unless considerable commodity diversification enlarges the period of essential percentage use. The production of perishable foods and requirements for refrigeration service at different seasons of the year may still leave the investment for the warehouse construction without adequate return, although the refrigeration facilities may be turned to other applications.

Some Modernizing

The problem seems more acute in areas where production of frozen foods, rather than market requirements, dominates the demand for more freezer space. In markets where relationship with wholesale distributors is involved, the participation of warehouses in new distribution trends may be easier, provided space is available for plant expansion or modification to meet the new requirements.

In some instances, the warehouse

F.I.—T.R.R.F.—1946 Frozen Food Survey
Warehouse Distributors

Question: Are you engaged in wholesale distribution of frozen foods? If not, are you interested in becoming a distributor?

Presently Distributing		Interested in Distributing	
Yes	No	Yes	No
6.5%	93.5%	17.9%	82.1%

industry is modernizing its facilities for use by distributors, providing break-down rooms, which the distributor may lease for the purpose of easily accessible storage. In some warehouses, these rooms are located on the main floor, with private loading platforms for distributor's trucks. In others, such as in New York, break-down rooms are not on the first floor and it is usually impossible to assign private loading platforms after 8:30 a. m. In these rooms is stored the merchandise that the distributor will need for the day. Then each night (or vice versa if the distributor loads at night) this stock will be replenished so that it will represent a complete inventory daily.

Things to Consider

Frozen food packers may have to consider the following when planning for the future:

1. Careful study of the amount of public freezer storage space available in the region directly adjacent to the packing operation; whether there are facilities located strategically for storage-in-transit and if sufficient space is consistently available in major markets.

2. If the packer finds he must build his own freezer storage to protect his interests, then he must study carefully the monthly accumulation and out-movement of his pack so that his storage will accommodate his current production.

As a safety factor, he should construct enough freezer space to (a) meet emergencies arising out of lack of sufficient reefer transport because the shortage of cars at peak season demand will doubtless persist for some time and (b) accommodate the anticipated peak production of bountiful seasons.

Balanced against this is the need for maintenance of high occupancy in a warehouse, ample in size but not unduly large for the expected output. Such a plant is primarily for temporary storage only of most of the packer's frozen merchandise. Packers need space for only that portion of each item packed which cannot ordinarily be shipped immediately after packing.

Cold pack fruits and berries in large containers (30 lb. cans to 50 gal. barrels) intended for remanufacture will probably continue to be handled through public cold storages in the markets. If they are included in the packer's estimate of output, it is likely that they will be shipped by the packer following a short period of storage.

Warehouse Distributors

Since it is impractical for frozen food distributors to operate out of some public warehouses, where facilities provided are for carlot handling instead of the movement of cases of retail and institutional packages, it seems that these distributors will have to construct their own small freezer storages. Such plants could be planned to be of a capacity that would accommodate up to a quarter of the distributor's annual requirements of frozen foods. Packers would then use the quarterly out-movement of merchandise to their distributors as a yardstick to measure the space needed to store these customers' annual requirements.

In view of such potential competition, it is not surprising that some public freezer storage companies are now distributing frozen foods by refrigerated trucks to retail outlets and locker plants and that others plan to do so. Distributors have demonstrated that theirs is a profitable business and there seems no better way for warehousemen to control a guaranteed amount of freezer storage occupancy than to enter this field. Several distributors indicate that their total annual sales run well above 5,000,000 lb. and such tonnage would provide a dual revenue to the warehouse-distributor in storage and sales profits.

Locker Plants

Sales to locker plants should conform with a public warehousing operation, inasmuch as such customers should order out their merchandise in quantity and they should not require frequent delivery because they have their own small but adequate freezing storage plants. Distribution of these commodities to locker plants could be handled by the warehouse, although it is quite possible that locker owners would prefer to pick up their own merchandise to absorb transportation costs.

Besides the frozen barreled fruits and berries that have been customarily stored in public freezers, public warehousemen may now look forward with some degree of certainty to the time when frozen food packers follow the traditional

Fig. 24. This specially designed poultry room holds temperatures at —10 deg. F.—ideal for poultry. Air, forced over refrigerated coils, enters the room through wall ducts.

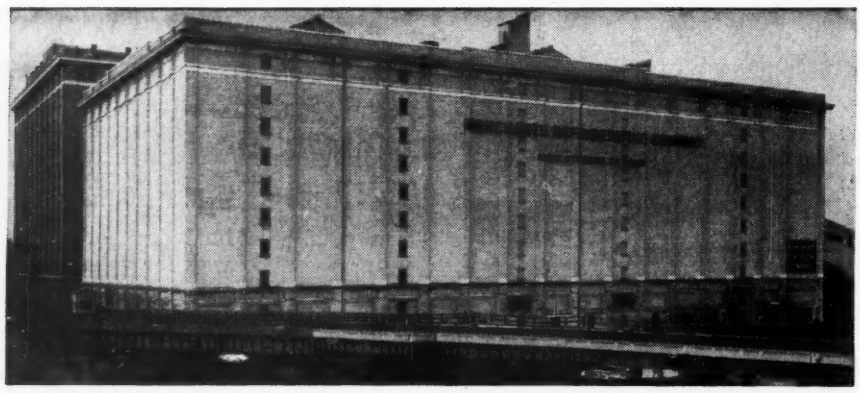


Fig. 25. The Merchants Refrigerating Co., New York City, with 2,818,311 cu. ft. of freezer and 2,796,195 cu. ft. of cooler space is one of the largest reefer warehouses.

method of selling and distributing through large direct-buyers, such as chainstore organizations, super market groups and cooperative buying organizations. Although these types of retail outlets have always maintained storage for their dry groceries, it is improbable that they will construct freezing storage plants in the immediate future in which to store their purchases of frozen foods. Many will doubtless rely on the public warehouses, although some are now building 3 to 5 car boxes. Many leading frozen food packers indicate that this type of selling and distribution is inevitable because, as with other foods, these outlets will economically warehouse and distribute frozen commodities. It would seem that it is not too early for public warehouses to prepare for this kind of business by making available the kind of facilities that will become necessary for the storage and handling of these volume distributors' frozen foods business. An essential need is private freezer storage room with sufficient space for the assembling of truck-route orders with a private loading dock.

There is no doubt that the frozen food industry has made striking progress both aside from and because of wartime stimulus. The high occupancy of freezer space in the country and the extremely tight condition in certain areas during seasons of production, despite conversion and construction, should not be ascribed merely to wartime conditions. The latter do exist but can be evaluated only with great difficulty and then with no certainty of accuracy.

When money is easy and opportunities for attractive investment comparatively limited, risk as well as investment capital is attracted to developments which seem to be on the upgrade and to have passed the purely exploratory stage. Frozen foods are in this category. The young industry has indeed gained in glamor, if not in fact, by the repeated recital of the industry's romantic history. It is no secret that merely capital to invest, rather than sound experience and intention, have underlain some of the frozen food undertakings that arose during the war. Conservative, experienced opinion does not consider this good for the industry. Packers and distributors should consider that hasty investment in freezer storage by inexperienced capital may prove to be equally unwise and hazardous to the industry.

This influx of inexperienced and sometimes too enthusiastic capital is especially invited if the warehouse industry chooses by undue conservation to disregard its logical function in relation to the new aspects of frozen food packing and distribution. It is not sound logic to blame short freezer space merely on the vagaries of war or postwar distortions of sound economic policy. It would seem more important that warehousemen take steps to protect their share of this fruit and vegetable freezer business since it now accounts for a significant part, about 30 percent, of freezer storage occupancy.

There are strong evidences that the basic demands for all frozen foods are increasing. Whether production is exceeding the capacity of public freezer storages is difficult to prove statistically. Even granted an ever-widening acceptance of frozen foods, it is also difficult to estimate ultimate increases in production. Such estimates are possible, however, when based on integrated and accurate data.

If the indicated expansion of the industry is to take place in an orderly manner, unhampered by bottlenecks, it is imperative that its several branches—production, transportation, warehousing, wholesale distribution, refrigeration equipment manufacture and retailing—correlate their programs.

There may be need for an industry coordinator, to gather accurate data and to chart a course of action.

F.I.—T.R.R.F. 1946 Frozen Food Survey
Freezer Storage Income

Question: What percent of your company's gross income is derived from freezer storage space?

Income from Freezer Storage	High	Low
54.7% Avg.	100%	4.5%

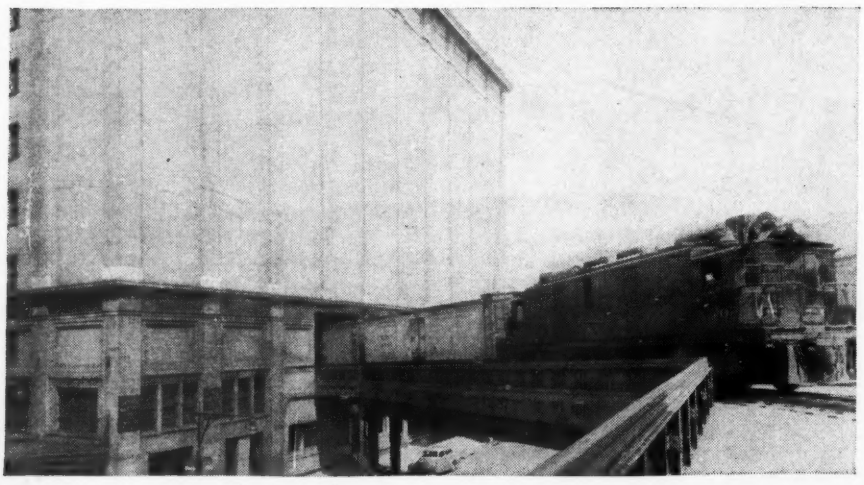


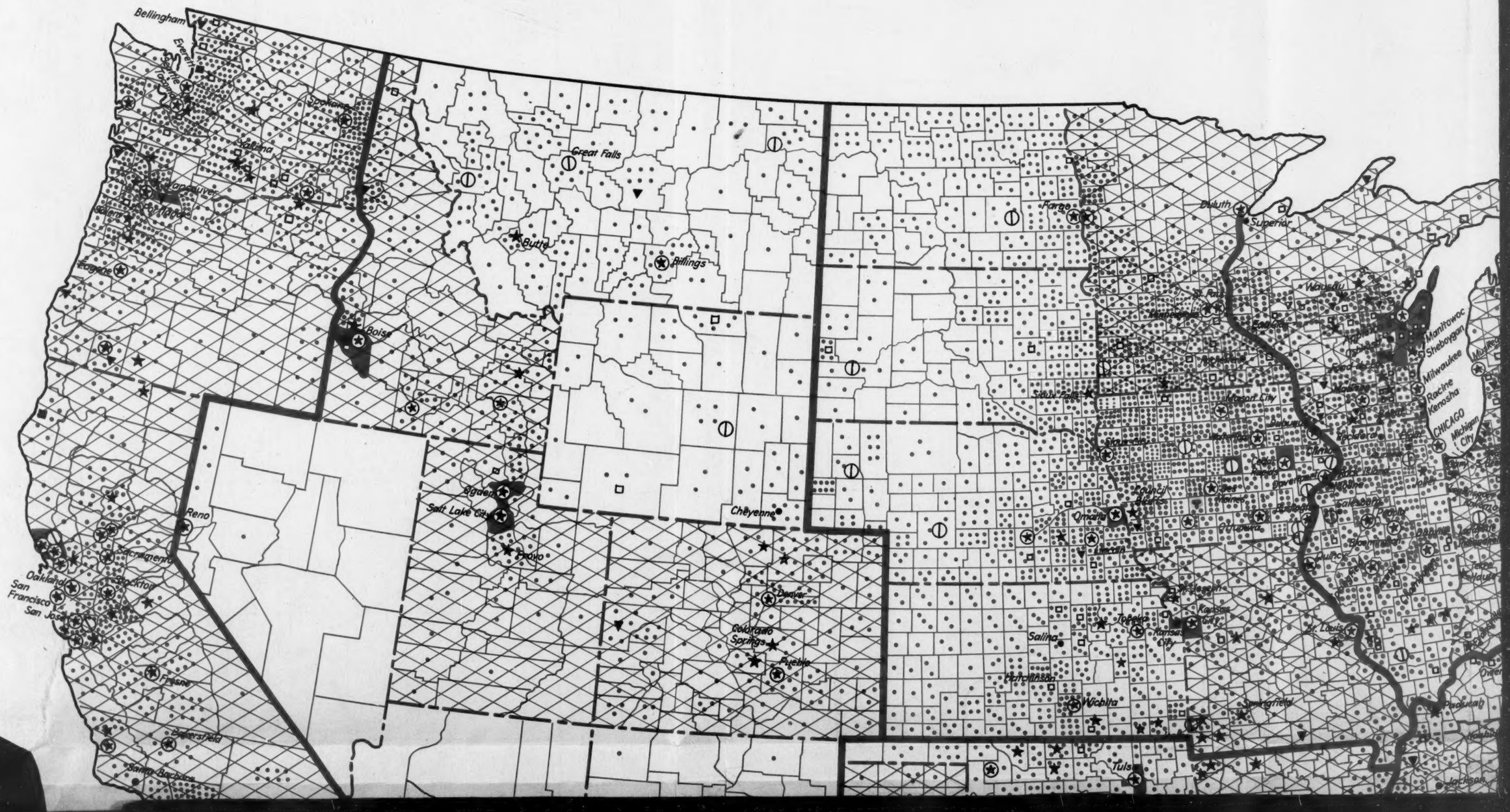
Fig. 26. The elevated rail spur leading into the Merchant's warehouse avoids surface traffic while delivering merchandise to fill the 5,614,506 cu. ft. of storage space.

FROZEN FOOD DISTRIBUTIONAL

OF THE UNITED STATES

Prepared by FOOD INDUSTRIES • Map Number 1

A McGRAW-HILL PUBLICATION



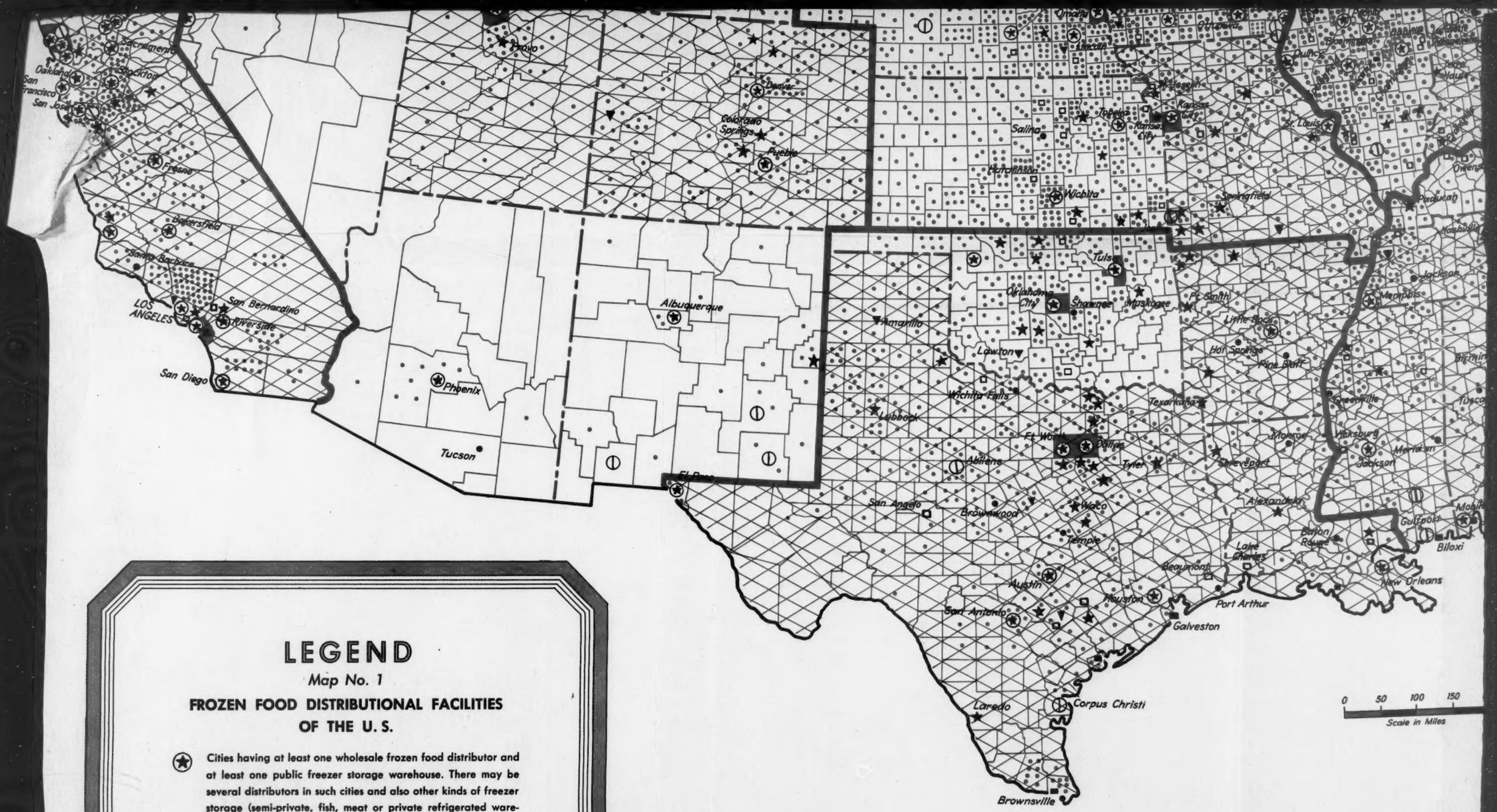
ZEN FOOD DISTRIBUTIONAL FACILITIES

OF THE UNITED STATES

Prepared by FOOD INDUSTRIES • Map Number 1

A McGRAW-HILL PUBLICATION

Great Falls
Butte
Billings
Cheyenne
Pueblo
Denver
Colorado Springs
Salina
Hutchinson
Wichita
Springfield
Tulsa
Oklahoma
Jackson
Forgo
Duluth
Superior
Waterloo
Appleton
Oshkosh
Sheboygan
Manitowoc
Milwaukee
Racine
Kenosha
CHICAGO
Michigan City
Rockford
Peoria
Bloomington
Decatur
Springfield
Joliet
Kankakee
Aurora
Omaha
Lincoln
Topeka
Kansas City
St. Louis
Quincy
Hannibal
Terre Haute
Indianapolis
Evansville
Louisville
Owensboro
Paducah
Nashville
Knoxville
Chattanooga
Bay City
Saginaw
Port Huron
DETROIT
Ann Arbor
Jackson
Toledo
Cleveland
Akron
Youngstown
Ashtabula
Erie
Niagara Falls
Buffalo
Jamestown
Syracuse
Rochester
Utica
Schenectady
Albany
Amsterdam
Binghamton
Scranton
Wilkes-Barre
Williamsport
Harrisburg
Altoona
Johnstown
Pittsburgh
Steubenville
Wheeling
Parkersburg
Clarksburg
Charleston
Huntington
Ashland
Lexington
Cincinnati
Portsmouth
Columbus
Springfield
Dayton
Lancaster
Zanesville
Cambridge
Wooster
Mansfield
Sandusky
Lorain
Canton
Akron
Warren
Meadville
Sharon
Farrell
Sharpsville
Mercer
Oil City
Franklin
Bradford
Olean
Salamanca
Dunkirk
Jamestown
Corning
Elmira
Binghamton
Utica
Rome
Watertown
Oswego
Syracuse
Auburn
Geneva
Canandaigua
Rochester
Batavia
Niagara Falls
Buffalo
Lockport
Tonawanda
Hornell
Olean
Bradford
Kingston
Poughkeepsie
Newburgh
Middletown
Port Jervis
Monticello
Hudson
Albany
Troy
Schenectady
Amsterdam
Gloversville
Johnstown
Little Falls
Utica
Rome
Oneonta
Binghamton
Elmira
Corning
Scranton
Wilkes-Barre
Hazleton
Williamsport
Sunbury
Harrisburg
Lancaster
Reading
Allentown
Bethlehem
Easton
Trenton
Atlantic City
Wilmington
Baltimore
Cumberland
Hagerstown
Washington
Richmond
Petersburg
Lynchburg
Danville
Roanoke
Rocky Mount
Durham
Raleigh
Goldsboro
Fayetteville
Wilmington
Winston-Salem
Greensboro
High Point
Asheville
Charlotte
Spartanburg
Greenville
Columbia
Knoxville
Chattanooga
Johnson City
Nashville
Jackson
Paducah
Springfield
Owensboro
Louisville
Lexington
Ashland
Huntington
Charleston
Parkersburg
Clarksburg
Wheeling
Steubenville
Pittsburgh
Johnstown
Altoona



LEGEND

Map No. 1

FROZEN FOOD DISTRIBUTIONAL FACILITIES OF THE U. S.

- Cities having at least one wholesale frozen food distributor and at least one public freezer storage warehouse. There may be several distributors in such cities and also other kinds of freezer storage (semi-private, fish, meat or private refrigerated warehouses).
- Cities having public freezer storage warehouses only.
- Cities having semi-private freezer storage warehouses only.
- Cities having freezer storage warehouses for fish (public and private).
- Cities having private and/or meat packing freezer storage warehouses.
- Cities having wholesale frozen food distributors only. (Some have locker plant facilities.)
- Cities (25,000 population or over) having no distributional facilites.
- Locker plants. (Also solid red areas.)
- Indicates the states producing 91.5% of the total U. S. output of frozen fruits and vegetables.
- U. S. Bureau of Census Regions.
- State Boundaries.
- County Boundaries.

FREEZER

One symbol, only, is used to denote the freezer storage warehouses in each city. Symbols indicate the relative importance of the freezer storage facilities for frozen food distribution. The ranking is: (1) Public warehouses, (2) semi-private, (3) fish, and/or (4) me houses age wa of refri the pu bol (se

Cheyenne
Denver
Colorado Springs
Pueblo
Albuquerque
Amarillo
Lubbock
Abilene
San Angelo
Brownwood
Wichita Falls
Lawton
Oklahoma City
Shawnee
Muskogee
Tulsa
Wichita
Salina
Topeka
Kansas City
Springfield
Omaha
Lincoln
Des Moines
Quincy
Peoria
Bloomington
Joliet
Chicago
Gary
Milwaukee
Rockford
Madison
Dubuque
Davenport
Rock Island
Moline
Galesburg
Terre Haute
Indianapolis
Evansville
Louisville
Owensboro
Paducah
St. Louis
Springfield
Nashville
Jackson
Memphis
Little Rock
Hot Springs
Pine Bluff
Texarkana
Shreveport
Monroe
Vicksburg
Meridian
Jackson
Greenville
Birmingham
Anniston
Tuscaloosa
Montgomery
Alexandria
Baton Rouge
Lake Charles
Beaumont
Port Arthur
Houston
Austin
San Antonio
Galveston
Corpus Christi
Laredo
Brownsville
Waco
Temple
Tyler
Dallas
Ft. Worth
Abilene
Detroit
Toledo
Flint
Saginaw
Bay City
Grand Rapids
Kalamazoo
Battle Creek
Lansing
Jackson
Ann Arbor
Cincinnati
Dayton
Middletown
Columbus
Springfield
Zanesville
Akron
Canton
Youngstown
Cleveland
Erie
Buffalo
Rochester
Syracuse
Utica
Albany
Binghamton
Elmira
Scranton
Wilkes-Barre
Allentown
Trenton
Wilmington
Baltimore
Cumberland
Hagerstown
Washington
Clarksburg
Parkersburg
Charleston
Huntington
Portsmouth
Ashland
Lexington
Richmond
Lynchburg
Petersburg
Newport News
Norfolk
Portsmouth
Roanoke
Danville
Rocky Mount
Durham
Raleigh
Winston-Salem
Greensboro
Goldsboro
Fayetteville
Wilmington
Asheville
Charlotte
Spartanburg
Greenville
Columbia
Sumter
Charleston
Knoxville
Chattanooga
Rome
Athens
Atlanta
Augusta
Macon
Savannah
Albany
Columbus
Gadsden
Pensacola
Panama City
Mobile
Gulfport
Biloxi
New Orleans
Jacksonville
Orlando
Tampa
St. Petersburg
West Palm Beach
Miami

0 50 100 150 200
Scale in Miles

FREEZER STORAGE FACILITIES

One symbol, only, is used to denote the freezer storage warehouses in each city. Symbols indicate the relative importance of the freezer storage facilities for frozen food distribution. The ranking is: (1) Public warehouses, (2) semi-private, (3) fish, and/or (4) meat or private freezer storage warehouses. A city having a public freezer storage warehouse and also several other kinds of refrigerated warehouses, is indicated by the public freezer storage warehouse symbol (see Legend).

Locker plants are located by counties only, not by the towns in which they are situated.

For further detailed information, refer to frozen food distribution facilities data on reverse side of this map.

BASE MAP COPYRIGHT RAND McNALLY & COMPANY, CHICAGO R. L. #4658

FROZEN FOOD DISTRIBUTIONAL FACILITIES OF U.S.A.

(1) STATE AND CITY(IES) (Including all cities shown on Map No. 2, *Food Industries* Frozen Food Marketing Areas)	(2) PUBLIC Refrigerated Warehouse Net Space Available (cu. ft.)	(3) ALL Refrigerated Warehouse Net Space in City (cu. ft.)	(4) Kinds of Refrigerated Warehouses in City: P	SP	F	Pr	M	(5) Wholesale Distributor(s) in City	(6) COUNTY(IES)	(7) Number of Locker Plants (County Total)	(8) Frozen Food Packer(s) in County
REGION: NEW ENGLAND											
MAINE State Total	see N. H.									4	6
Auburn (See Lewiston)							M		Androscoggin	0	
Bangor	40,000†		P					x	Penobscot	0	x
Lewiston-Auburn							M		Androscoggin	0	
Portland		442,000	P		F	Pr		x	Cumberland	0	x
									Washington	0	x
									Hancock	0	x
VERMONT State Totals	see N. H.									48	0
Barre											
Burlington	90,000†					Pr			Washington	1	
Cabot			P						Chittendon	9	
Milton				SP					Washington	1	
Rutland	72,000†					Pr			Chittendon	9	
Wells River			P			Pr			Rutland	7	
									Orange	1	
NEW HAMPSHIRE											
State Totals (Incl. Me., Vt.)	672,000									19	0
Concord									Merrimack	2	
Manchester		4,000	P					x	Hillsborough	4	
MASSACHUSETTS State Totals	5,234,000									25	29
Boston	2,793,000	3,590,000	P		F	Pr	M	x	Suffolk	4	x
Cambridge								x	Middlesex	5	x
Dorchester								x	Suffolk	4	x
Everett								x	Middlesex	5	x
Fall River—New Bedford			P					x	Bristol	1	x
Fitchburg								x	Worcester	3	
Gloucester				SP	F	Pr			Essex	3	x
Greenfield			P						Franklin	1	
Holyoke (see Springfield)									Hampden	1	
Lawrence								x	Essex	3	x
Lowell				SP					Middlesex	5	x
Malden								x	Middlesex	5	x
Milton								x	Norfolk	1	
New Bedford (see Fall River)									Bristol	1	x
North Abington								x	Plymouth	2	
North Truro						Pr			Barnstable	1	x
Pittsfield			P					x	Berkshire	2	
Provincetown									Barnstable	1	
Quincy						Pr			Barnstable	1	x
Sandwich			P					x	Norfolk	1	
Somerville									Barnstable	1	x
Springfield-Holyoke		505,000	P		F		M	x	Middlesex	5	x
Watertown								x	Hampden	1	
Worcester		406,000	P					x	Middlesex	5	x
									Worcester	3	
RHODE ISLAND State Totals	see Conn.									2	1
Providence	237,600†		P					x	Providence	0	
									Washington	1	x
CONNECTICUT State Totals (Incl. R. I.)	307,000									18	0
Bridgeport	11,815†		P					x	Fairfield	4	
Danielson								x	Windham	3	
Hartford-New Britain		112,000		SP				x	Hartford	4	
New Britain (See Hartford)									Hartford	4	
New Haven-Waterbury		169,000	P	SP		Pr	M	x	New Haven	1	
New London								x	New London	1	
North Haven			P						New Haven	1	
Norwich								x	New London	1	
South Norwalk								x	Fairfield	4	
Waterbury (see New Haven)								x	New Haven	1	
Region Totals: New England	6,213,000	8,199,000								121	36
REGION: MID ATLANTIC											
NEW YORK State Totals	15,816,000	17,842,000								161	75
Albany-Schenectady-Troy		780,000	P				M	x	Albany Rensselaer, Schenectady	3	
Alfred Station				SP					Allegany	1	
Amsterdam									Clinton	1	
Arkport						Pr			Steuben	3	
Auburn									Chenango	4	
Barker			P						Niagara	2	x
Binghamton		219,000	P	SP				x	Broome	4	
Brockport	217,440†		P						Monroe	5	x
Brooklyn	2,019,672†	see N. Y.	P		F	Pr	M		Kings	0	
Buffalo-Niagara Falls	2,331,000	2,938,000	P	SP	F	Pr	M	x	Erie, Niagara	11	x
Cape Vincent						Pr			Jefferson	4	
Clintondale	47,520†		P						Ulster	5	x
Cuba				SP		Pr			Allegany	1	
Delhi						Pr			Delaware	0	
Dunkirk						Pr			Chautauqua	4	x
Elmira	343,968‡		P		F			x	Chemung	2	
Geneva	125,751†		P						Ontario	5	x
Glens Falls									Fulton	1	
Gouverneur						Pr			St. Lawrence	5	
Heuvelton				SP					St. Lawrence	5	
Highland			P			Pr			Ulster	5	x
Holley	325,000‡		P						Orleans	3	x
Hornell			P	SP					Steuben	3	
Hudson			P	SP					Columbia	3	
Ithaca								x	Tompkins	2	
Jamaica							M		Queens	0	x
Jamestown	92,160†		P			Pr	M	x	Chautauqua	4	x
Kingston					F				Ulster	5	x
Le Roy	68,400†		P						Genesee	3	x
Long Island City (see N. Y.)				SP				x	Queens	0	x
Lowville				SP					Lewis	1	
Lyons			P						Wayne	5	x
Malone						Pr			Franklin	1	
Masecna				SP					St. Lawrence	5	
Medina	80,640†		P						Orleans	3	x
Middleport			P						Niagara	2	x
Morton			P						Orleans	3	x
Newburgh								x	Orange	4	x
New York (Incl. Jersey City and Long Island)	13,954,000†	14,963,000	P	SP	F	Pr	M	x	Bronx, Kings, New York, Queens and Richmond, N. Y.; Hudson, N. J.	0	x
North Collins				SP		Pr			Erie	9	x
North Rose			P						Wayne	5	x
Norwood						Pr			St. Lawrence	5	
Olean					F				Cattaraugus	4	
Ontario			P						Wayne	5	x
Oswego	52,488†		P						Oswego	1	
Poughkeepsie			P				M		Dutchess	8	x
Pratsburg						Pr			Steuben	3	
Rochester	1,466,000	1,737,000	P		F	Pr	M	x	Monroe	5	x
Rome (see Utica)			P			Pr			Oneida	7	
Saranac Lake						Pr			Franklin	1	
Schenectady (see Albany)			P					x	Schenectady	1	
Sodus	144,000†		P						Wayne	5	x
Syracuse		615,000	P		F	Pr	M	x	Onondaga	6	
Troy (see Albany)						Pr	M		Rensselaer	1	
Utica-Rome		106,000	P	SP		Pr	M	x	Oneida	7	
Waddington						Pr			St. Lawrence	5	
Wallington			P						Wayne	5	x
Walton									Delaware	0	
Waterport	298,800†		P		F				Orleans	3	x
Watertown						Pr		x	Jefferson	4	
Webster	180,000†		P						Monroe	5	x

(1) STATE AND CITY(IES) (Including all cities shown on Map No. 2, *Food Industries* Frozen Food Marketing Areas)	(2) PUBLIC Refrigerated Warehouse Net Space Available (cu. ft.)	(3) ALL Refrigerated Warehouse Net Space in City (cu. ft.)	(4) Kinds of Refrigerated Warehouses in City: P	SP	F	Pr	M	(5) Wholesale Distributor(s) in City	(6) COUNTY(IES)	(7) Number of Locker Plants (County Total)	(8) Frozen Food Packer(s) in County
REGION: EAST NORTH CENTRAL (Continued)											
INDIANA State Totals	1,192,000	2,340,000								159	5
Anderson							M		Madison	4	
Centerville									Wayne	3	
Elkhart	98,141†		P						Elkhart	5	
Elwood							M		Madison	4	
Evansville		228,000	P				M		Vanderburgh	0	
Fort Branch							M		Gibson	0	
Fort Wayne		198,000	P	SP			M		Allen	7	x
Gary									Lake	7	
Hammond		see Chicago	P						Lake	7	
Huntington								x	Huntington	2	
Indianapolis		1,649,000	P		F		M	x	Marion	1	x
Kokomo									Howard	1	
La Fayette							M	x	Tippecanoe	5	
Logansport									Cass	2	
Marion									Grant	3	
Michigan City									La Porte	4	
Mishawaka							M		St. Joseph	5	
Muncie				SP	F				Delaware	4	
New Albany			P						Floyd	0	
Richmond									Wayne	3	
Rochester							M		Fulton	2	
South Bend	41,283†		P						St. Joseph	5	
Terre Haute		90,000	P				M		Vigo	1	
ILLINOIS State Totals	15,832,000	20,574,000								424	29
Alton							M		Madison	5	
Aurora									Kane	10	
Bloomington			P					x	McLean	12	
Bushnell						Pr			McDonough	6	
Champaign	7,776†		P			Pr			Champaign	8	
Chicago (Incl. Hammond, Ind.)	15,223,000	19,452,000	P	SP	F	Pr	M	x	Cook	7	x
Danville							M		Vermilion	5	
Decatur (Incl. Springfield)		119,000			F		M		Macon	6	
Du Quoin									Perry	1	
East St. Louis (see St. Louis)							M	x	St. Clair	4	
Elgin	12,960†		P						Kane	10	
Flora			P						Clay	2	
Galesburg									Knox	5	
Harrisburg						Pr			Saline	1	
Joliet			P				M		Will	8	
Moline (see Davenport, Iowa)									Rock Island	7	
Monmouth								x	Warren	7	
National City							M		St. Clair	4	
National Stock Yards	150,509†		P						St. Clair	4	
Olney	7,886†		P						Richland	2	
Pana						Pr			Christian	5	
Peoria		84,000	P	SP	F		M	x	Peoria	5	
Quincy			P					x	Adams	4	x
Rockford									Winnebago	7	
Rock Island (see Davenport)									Rock Island	7	
St. Clair							M		St. Clair	4	
Salem									Marion	3	
Springfield		see Decatur			F			x	Sangamon	8	
Tuscola			P						Douglas	5	
									Lake	8	x
MICHIGAN State Totals	3,763,000	5,049,000								174	25
Alma						Pr			Gratiot	2	
Ann Arbor									Washtenaw	7	
Battle Creek									Calhoun	6	
Bay City (see Saginaw)					F	Pr			Bay	4	x
Benton Harbor				SP					Berrien	8	x
Detroit	2,866,000	3,132,000	P		F		M	x	Wayne	4	x
Eaton Rapids						Pr			Eaton	4	
Escanaba						Pr			Delta	2	
Fennville						Pr			Allegan	4	x
Flint									Genesee	4	
Fremont						Pr			Newaygo	2	x
Grand Rapids		803,000	P		F			x	Kent	4	
Hancock				SP					Houghton	1	x
Holland				SP					Ottawa	4	x
Jackson				SP					Jackson	1	
Kalamazoo		4,000		SP				x	Kalamazoo	1	
Lansing		35,000	P					x	Ingham	5	x
Manistique						Pr			Schoolcraft	0	
Menominee							M		Menominee	0	
Morenci			P						Lenawee	5	
Muskegon	540,000‡		P					x	Muskegon	0	x
Petoskey			P					x	Emmet	1	
Port Huron								x	St. Clair	3	
Saginaw-Bay City		247,000	P	SP	F	Pr		x	Saginaw	3	x
St. Joseph				SP					Berrien	8	x
Sodus				SP					Berrien	8	x
Traverse City				SP					Grand Traverse	2	x
Zeeland						Pr			Ottawa	4	x
									Van Buren	2	x
									Oceana	0	x
									Leelanau	0	x
WISCONSIN State Totals	1,433,000	2,587,000								478	9
Algoma						Pr			Kewaunee	21	
Antigo			P						Langlade	2	
Appleton									Outagamie	25	
Bayfield						Pr			Bayfield	0	
Beaver Dam			P						Dodge	12	
Beloit									Rock	8	
Brodhead						Pr			Green	3	
Cleveland						Pr			Manitowoc	30	x
Clintonville						Pr			Waupaca	9	
De Pere			P			Pr			Brown	36	x
Eau Claire							M		Eau Claire	4	
Edgar				SP					Marathon	15	
Fennimore						Pr			Grant	13	
Fond du Lac	50,057†		P	SP					Fond du Lac	13	
Fort Atkinson							M		Jefferson	6	
Francis Creek						Pr			Manitowoc	30	x
Green Bay	80,640†		P	SP	F	Pr			Brown	36	x
Jefferson							M		Jefferson	6	
Johnson Creek						Pr			Jefferson	6	
Juneau						Pr			Dodge	12	
Kenosha									Kenosha	1	
Kewaunee			P						Kewaunee	21	
La Crosse									La Crosse	3	
Madison		639,000	P				M	x	Dane	13	
Manitowoc	15,120†		P			Pr			Manitowoc	30	x
Marinette			P						Marinette	3	
Marshfield	8,865†		P			Pr			Wood	8	
Milwaukee	976,000	1,361,000	P		F		M	x	Milwaukee	1	x
Monroe			P	SP		Pr			Green	3	
Monticello				SP					Green	3	
Mosinee						Pr			Marathon	15	
Neenah						Pr			Winnebago	8	
Oshkosh									Winnebago	8	
Platteville				SP					Grant	13	
Plymouth			P			Pr			Sheboygan	6	
Racine									Racine	5	
Reedsville						Pr			Manitowoc	30	x
Richland Center				SP					Richland	2	
Ripon	13,464†				F				Fond du Lac	13	
Sawyer			P						Door	12	x
Seymour						Pr			Outagamie	25	
Shawano				SP					Shawano	17	
Sheboygan						Pr			Sheboygan	6	
Sherwood						Pr			Calumet	12	
Stanley				SP					Chippewa	8	
Stevens Point						Pr			Portage	7	
Superior									Douglas	2	
Thiensville						Pr			Ozaukee	4	x
Thorp						Pr			Clark	13	
Two Rivers						Pr			Manitowoc	30	x
Watertown			P						Jefferson	6	

(1) STATE AND CITY(IES) (Including all cities shown on Map No. 2, *Food Industries* Frozen Food Marketing Areas)	(2) PUBLIC Refrigerated Warehouse Net Space Available (cu. ft.)	(3) ALL Refrigerated Warehouse Net Space in City (cu.ft.)	(4) Kinds of Refrigerated Warehouses in City: P	SP	F	Pr	M	(5) Wholesale Distributor(s) in City	(6) COUNTY(IES)	(7) Number of Locker Plants (County Total)	(8) Frozen Food Packer(s) in County
REGION: WEST NORTH CENTRAL (Continued)											
KANSAS (Cont.)											
Topeka		777,000	P	SP			M	x	Shawnee	3	x
Wichita		786,000	P				M	x	Sedgwick	10	
Winfield			P						Cowley	3	
Region Totals: West N. Cent.	16,379,000	29,799,000								2,406	47
REGION: SOUTH ATLANTIC											
DELAWARE State Totals	229,000	see Md.								5	7
Bridgeville	54,000		P						Sussex	2	x
Dover			P						Kent	2	
Wilmington	50,400		P				M	x	New Castle	1	
VIRGINIA State Totals	see W. Va.	see Md.								29	8
Bristol							M		Washington	1	
Broadway								x	Rockingham	1	x
Crozet	54,000†		P						Albemarle	2	x
Danville			P						Pittsylvania	0	
Exmore				SP					Northampton	1	
Harrisonburg	2,014†		P					x	Rockingham	1	x
Lynchburg			P						Campbell	0	
Newport News (see Norfolk)								x	Warwick	0	
Norfolk-Portsmouth-Newport-News	1,033,000†	1,051,000	P		F			x	Norfolk, Warwick	0	x
Peterburg			P						Dinwiddie	0	x
Portsmouth (see Norfolk)							M		Norfolk	0	x
Richmond	465,000†	531,000	P		F		M	x	Henrico	0	x
Roanoke			P					x	Roanoke	2	x
Winchester	52,000‡							x	Frederick	2	x
Yorktown					F				York	0	
									Lancaster	1	x
WEST VIRGINIA State Totals (Incl. Virginia)	1,581,000	see Md.								2	0
Charleston	36,000†		P						Kanawha	0	
Clarkesburg									Harrison	0	
Huntington									Cabell	0	
Parkersburg			P						Wood	1	
Roncevert						Pr			Greenbrier	0	
Wheeling			P				M		Ohio	1	
MARYLAND State Totals—(Incl. D. C.)	1,854,000	4,096,000								22	14
(Incl. Del., Va., W.Va. &D.C.)											
Baltimore	624,000	670,000	P		F	Pr	M	x	Baltimore City	1	x
Crisfield			P						Somerset	0	x
Cumberland									Allegany	0	
Hagerstown			P					x	Washington	3	
									Caroline	1	x
									Talbot	1	x
									Wicomico	1	x
									Worcester	0	x
DISTRICT OF COLUMBIA D. C. Totals	see Md.	see Md.								0	0
Washington	908,565‡		P		F			x		0	
NO. CAROLINA State Totals	See S. C.	see Fla.								29	2
Asheville		13,000	P						Buncombe	1	
Chadbourn			P						Columbus	1	
Charlotte		176,000	P			Pr			Mecklenburg	1	
Durham									Durham	0	
Fayetteville									Cumberland	0	x
Goldsboro									Wayne	2	
Greensboro									Guilford	0	
Hendersonville			P						Henderson	1	x
Hickory							M		Catawba	2	
Laurinburg			P						Scotland	0	
Raleigh				SP		Pr			Wake	1	
Rocky Mount									Edgecombe	1	
Waynesville			P						Haywood	1	
Wilmington	62,640†		P						New Hanover	0	
Winston-Salem			P						Forsyth	0	
									Duplin	0	x
SO. CAROLINA State Totals (Incl. No. Carolina)	305,000	see Fla.								43	2
Charleston	9,360†		P			Pr			Charleston	0	
Columbia			P						Richland	2	
Florence						Pr			Florence	0	x
Greenville									Greenville	4	
Newberry			P						Newberry	0	
Orangeburg							M		Orangeburg	2	
Spartanburg									Spartanburg	1	
Sumter									Sumter	1	
									Saluda	1	x
GEORGIA State Totals	1,099,000	see Fla.								73	5
Albany			P				M		Dougherty	1	
Athens								x	Clarke	1	
Atlanta		899,000	P		F		M	x	Fulton	0	
Augusta			P						Richmond	0	
Bainbridge			P						Decatur	1	
Blackshear			P						Pierce	0	
Camilla	10,045†		P						Mitchell	3	
Claxton			P						Evans	1	
Colquitt			P						Miller	0	
Columbus			P		F			x	Muscogee	0	
Cordele			P						Crisp	1	
Donalsonville			P						Seminole	0	
Douglas			P						Coffee	2	
Folkston							M		Charlton	0	
Griffin			P						Spalding	1	x
Hahira			P						Lowndes	1	
Hartwell			P						Hart	0	
Hawkinsville			P						Pulaski	1	
Hazelhurst							M		Jeff Davis	0	
Homerville			P						Clinch	0	
Jesup			P						Wayne	0	
Macon			P						Bibb	0	x
Metter			P						Candler	0	
Monticello				SP					Jasper	2	x
Moultrie							M		Colquitt	0	
Mount Vernon			P						Montgomery	0	x
Ochlocknee			P						Thomas	1	
Quitman			P						Brooks	2	
Rome			P						Floyd	0	
Savannah					F				Chatham	0	
Swainsboro			P						Emanuel	1	
Thomasville	4,320†		P						Thomas	1	
Tifton			P				M		Tift	3	
Valdosta			P	SP					Lowndes	1	
Waycross			P						Ware	1	
									Harris	0	x
FLORIDA State Totals (Incl. N. C., S. C. and Ga.)	721,000	3,040,000								19	12
Clearwater			P						Pinellas	1	x
Dunedelon			P						Marion	2	
Fort Lauderdale			P						Broward	0	

(1) STATE AND CIT (Including all cities on Map No. 2, *Food* Frozen Food Market	(2)	(3)	(4)	(5)	(6)	(7)	(8)
REGION: WEST S							
TEXAS (Cont.)							
Hamilton							
Harlingen							
Houston							
Laredo							
Lubbock							
Marlin							
McKinney							
Port Arthur (see Be							
Port Lavacs							
San Angelo							
San Antonio							
Sequin							
Sherman							
Smiley							
Temple							
Texarkana							
Tyler							
Vernon							
Waco							
Waxahachie							
Wichita Falls							
ARKANSAS St							
Fort Smith							
Harrison							
Hot Springs							
Little Rock							
Nashville							
Pine Bluff							
Rogers							
Siloam Springs							
LOUISIANA St (Incl. Okla.							
Alexandria							
Baton Rouge							
Hammond							
Lake Charles							
Monroe							
Morgan City							
New Orleans							
Ponchatoula							
Shreveport							
Region Totals: Wes							
REGION: MOUNT							
MONTANA S							
Billings							
Butte							
Great Falls							
Lewistown							
Missoula							
Wolf Point							
IDAHO S							
Boise							
Caldwell							
Emmett							
Idaho Falls							
Lewiston							
Nampa							
Pocatello							
Sandpoint							
Twin Falls							
WYOMING S							
Casper							
Cheyenne							
Rock Springs							
Sheridan							
COLORADO S							
Canon City							
Colorado Springs							
Denver							
Fort Collins							
Grand Junction							
Greeley							
Pueblo							
UTAH S							
Brigham City							
Ogden							
Provo							
Salt Lake City							
NEVADA S							
Reno							
ARIZONA St							
Phoenix							
Tucson							
NEW MEXICO S							
Albuquerque							
Carlsbad							
Clovis							
Deming							
Roswell							
Region Totals:							
REGION: PACIFI							
CALIFORNIA S							
Atascadero							
Bakersfield							
Chico							
Eureka							
Fresno							
Glendale							
Healdsburg							
Long Beach							

FOOD DISTRIBUTIONAL FACILITIES OF U.S.A.

(1) STATE AND CITY (IES) (Including all cities shown on Map No. 2, *Food Industries* Frozen Food Marketing Areas)	(2) PUBLIC Refrigerated Warehouse Net Space Available (cu. ft.)	(3) ALL Refrigerated Warehouse Net Space in City (cu. ft.)	(4) Kinds of Refrigerated Warehouses in City P	SP	F	Pr	M	(5) Wholesale Distributor(s) in City	(6) COUNTY (IES)	(7) Number of Locker Plants (County Total)	(8) Frozen Food Packer(s) in County
REGION: WEST NORTH CENTRAL (Continued)											
KANSAS (Cont.)											
Topeka		777,000	P	SP			M	x	Shawnee	3	x
Wichita		786,000	P				M	x	Sedgwick	10	
Winfield			P						Cowley	3	
Region Totals: West N. Cent.	**16,379,000**	**29,799,000**								**2,406**	**47**
REGION: SOUTH ATLANTIC											
DELAWARE State Totals	**229,000**	**see Md.**								**5**	**7**
Bridgeville	54,000		P						Sussex	2	x
Dover			P						Kent	2	
Wilmington	50,400		P				M	x	New Castle	1	
VIRGINIA State Totals	**see W. Va.**	**see Md.**								**29**	**8**
Bristol							M		Washington	1	
Broadway								x	Rockingham	1	x
Crozet	54,000†		P						Albemarle	2	x
Danville			P						Pittsylvania	0	
Exmore				SP					Northampton	1	
Harrisonburg	2,014†		P					x	Rockingham	1	x
Lynchburg			P						Campbell	0	
Newport News (see Norfolk)								x	Warwick	0	
Norfolk-Portsmouth-Newport-News	1,033,000†	1,051,000	P		F			x	Norfolk, Warwick	0	x
Petersburg			P						Dinwiddie	0	
Portsmouth (see Norfolk)							M		Norfolk	0	x
Richmond	465,000†	531,000	P		F		M	x	Henrico	0	x
Roanoke			P					x	Roanoke	2	
Winchester	52,000‡		P					x	Frederick	2	x
Yorktown					F				York	0	
									Lancaster	1	x
WEST VIRGINIA State Totals (Incl. Virginia)	**1,581,000**	**see Md.**								**2**	**0**
Charleston	36,000†		P						Kanawha	0	
Clarkesburg									Harrison	0	
Huntington									Cabell	0	
Parkersburg			P						Wood	1	
Ronceverte						Pr			Greenbrier	0	
Wheeling			P				M		Ohio	1	
MARYLAND State Totals— (Incl. D. C.) (Incl. Del., Va., W. Va. & D.C.)	**1,854,000**	**4,096,000**								**22**	**14**
Baltimore	624,000	670,000	P		F	Pr	M	x	Baltimore City	1	x
Crisfield			P						Somerset	0	x
Cumberland									Allegany	0	
Hagerstown			P					x	Washington	3	
									Caroline	1	x
									Talbot	1	x
									Wicomico	1	x
									Worcester	0	x
DISTRICT OF COLUMBIA D. C. Totals	**see Md.**	**see Md.**								**0**	**0**
Washington	908,565‡		P		F			x		0	
NO. CAROLINA State Totals	**See S. C.**	**see Fla.**								**29**	**2**
Asheville		13,000	P						Buncombe	1	
Chadbourn			P						Columbus	1	
Charlotte		176,000	P			Pr			Mecklenburg	1	
Durham									Durham	0	
Fayetteville									Cumberland	0	
Goldsboro									Wayne	2	
Greensboro									Guilford	0	
Hendersonville			P						Henderson	1	x
Hickory							M		Catawba	2	
Laurinburg			P						Scotland	0	
Raleigh				SP		Pr			Wake	1	
Rocky Mount									Edgecombe	1	
Waynesville			P						Haywood	1	
Wilmington	62,640†		P						New Hanover	0	
Winston-Salem			P						Forsyth	0	
									Duplin	0	x
SO. CAROLINA State Totals (Incl. No. Carolina)	**305,000**	**see Fla.**								**43**	**2**
Charleston	9,360†		P			Pr			Charleston	0	
Columbia			P						Richland	2	
Florence						Pr			Florence	0	x
Greenville									Greenville	4	
Newberry			P						Newberry	0	
Orangeburg							M		Orangeburg	2	
Spartanburg									Spartanburg	1	
Sumter									Sumter	1	
									Saluda	1	x
GEORGIA State Totals	**1,098,000**	**see Fla.**								**73**	**5**
Albany			P				M		Dougherty	1	
Athens								x	Clarke	1	
Atlanta		899,000	P		F		M	x	Fulton	0	
Augusta			P						Richmond	1	
Bainbridge			P						Decatur	0	
Blackshear			P						Pierce	1	
Camilla	10,045†		P						Mitchell	3	
Claxton			P						Evans	1	
Colquitt			P						Miller	0	
Columbus			P		F			x	Muscogee	0	
Cordele			P						Crisp	1	
Donalsonville			P						Seminole	0	
Douglas			P						Coffee	2	
Folkston							M		Charlton	0	
Griffin			P						Spalding	1	x
Habira			P						Lowndes	1	
Hartwell			P						Hart	0	
Hawkinsville			P						Pulaski	0	
Hazelhurst							M		Jeff Davis	0	
Homerville				P					Clinch	0	
Jesup				P					Wayne	0	
Macon				P					Bibb	0	x
Metter			P						Candler	0	
Monticello				SP					Jasper	2	x
Moultrie							M		Colquitt	0	
Mount Vernon									Montgomery	0	
Ochlocknee				P					Thomas	1	
Quitman				P					Brooks	1	
Rome				P					Floyd	2	
Savannah			P		F				Chatham	0	
Swainsboro									Emanuel	1	
Thomasville	4,320†			P					Thomas	1	
Tifton				P			M		Tift	3	
Valdosta				SP					Lowndes	1	
Waycross				P					Ware	1	
									Harris	0	x
FLORIDA State Totals (Incl. N. C., S. C. and Ga.)	**721,000**	**3,040,000**								**19**	**12**
Clearwater			P						Pinellas	1	x
Dunnellon			P						Marion	2	
Fort Lauderdale			P						Broward	0	
Fort Pierce			P						Saint Lucie	0	
Gainesville		410,000	P		F			x	Alachua	0	
Jacksonville			P						Duval	1	x
Mayo		57,000	P		F			x	Lafayette	0	
Miami			P						Dade	2	x
Orlando				SP					Orange	2	
Panacea									Wakulla	0	
Panama City			P						Bay	0	
Pensacola			P						Escambia	1	x
Plant City									Hillsborough	0	

(1) STATE AND CITY (IES) (Including all cities shown on Map No. 2, *Food Industries* Frozen Food Marketing Areas)	(2) PUBLIC Refrigerated Warehouse Net Space Available (cu. ft.)	(3) ALL Refrigerated Warehouse Net Space in City (cu. ft.)	(4) Kinds of Refrigerated Warehouses in City P	SP	F	Pr	M	(5) Wholesale Distributor(s) in City	(6) COUNTY (IES)	(7) Number of Locker Plants (County Total)	(8) Frozen Food Packer(s) in County
REGION: WEST SOUTH CENTRAL (Continued)											
TEXAS (Cont.)											
Hamilton				SP					Hamilton	3	
Harlingen					F				Cameron	6	x
Houston	224,000	304,000	P				M	x	Harris	2	x
Laredo			P						Webb	0	
Lubbock			P						Lubbock	3	
Marlin			P						Falls	2	
McKinney			P						Collin	6	
Port Arthur (see Beaumont)									Jefferson	0	
Port Lavaca					F				Calhoun	0	
San Angelo						Pr			Tom Green	1	
San Antonio	880,000	911,000	P				M	x	Bexar	4	
Sequin			P						Guadalupe	1	
Sherman			P						Grayson	4	
Smiley			P			Pr			Gonzales	2	
Temple									Bell	4	
Texarkana			P						Bowie, Tex., Miller, Ark	1	
Tyler			P						Smith	3	x
Vernon							M		Wilbarger	1	
Waco	8,000		P				M		McLennan	4	
Waxahachie			P						Ellis	4	
Wichita Falls									Wichita	4	
									Dawson	2	x
									Dimmit	0	x
									Hidalgo	8	x
									Brazoria	1	x
									Matagorda	1	x
									Aransas	0	x
									Maverick	0	x
ARKANSAS State Totals	**249,000**	**see La.**								**55**	**2**
Fort Smith			P						Sebastian	1	x
Harrison			P						Boone	0	
Hot Springs									Garland	0	
Little Rock		115,000	P		F		M	x	Pulaski	2	x
Nashville			P						Howard	1	
Pine Bluff									Jefferson	0	
Rogers			P						Benton	3	
Siloam Springs			P						Benton	3	
LOUISIANA State Totals (Incl. Okla. and Ark.)	**792,000**	**2,689,000**								**19**	**11**
Alexandria			P						Rapides	0	
Baton Rouge									E. Baton Rouge	1	
Hammond			P						Tangipahoa	0	x
Lake Charles							M		Calcasieu	1	
Monroe									Ouachita	1	
Morgan City					F				Saint Mary	0	x
New Orleans	746,000	1,372,000			F			x	Orleans	0	x
Ponchatoula						Pr			Tangipahoa	0	x
Shreveport			P						Caddo	2	
									Acadia	1	x
Region Totals: West So. Cent.	**5,607,000**	**7,764,000**								**583**	**27**
REGION: MOUNTAIN											
MONTANA State Totals										**139**	**0**
Billings			P					x	Yellowstone	9	
Butte	22,680†		P			Pr			Silver Bow	4	
Great Falls						Pr	M	x	Cascade	5	
Lewistown				SP					Fergus	6	
Missoula								x	Missoula	5	
Wolf Point								x	Roosevelt	4	
IDAHO State Totals										**148**	**4**
Boise	12,240†		P					x	Ada	12	
Caldwell			P						Canyon	10	x
Emmett	5,040†		P						Gem	2	
Idaho Falls			P						Bonneville	4	
Lewiston				SP			M		Nez Perce	6	x
Nampa							M		Canyon	10	x
Pocatello	39,225†		P			Pr		x	Bannock	6	
Sandpoint							M		Bonner	3	
Twin Falls	48,163†		P					x	Twin Falls	4	
WYOMING State Totals										**53**	**0**
Caspar								x	Natrona	4	
Cheyenne									Laramie	6	
Rock Springs							M		Sweetwater	2	
Sheridan							M		Sheridan	5	
COLORADO State Totals										**125**	**8**
Canon City			P						Fremont	3	
Colorado Springs			P				M		El Paso	3	
Denver	1,288,000		P	SP	F	Pr	M	x	Denver	3	x
Fort Collins			P						Larimer	3	x
Grand Junction				SP					Mesa	5	x
Greeley			P						Weld	11	
Pueblo	222,000		P		F		M	x	Pueblo	8	
									Delta	5	x
UTAH State Totals										**77**	**11**
Brigham City						Pr			Box Elder	6	
Ogden	7,776†		P			Pr	M	x	Weber	7	x
Provo			P						Utah	11	x
Salt Lake City	515,000		P			Pr	M	x	Salt Lake	16	x
									Davis	6	x
NEVADA State Totals										**5**	**0**
Reno			P	SP		Pr		x	Washoe	4	
ARIZONA State Totals										**9**	**1**
Phoenix	69,000‡		P				M	x	Maricopa	7	x
Tucson									Pima	0	
NEW MEXICO State Totals										**18**	**0**
Albuquerque			P					x	Bernalillo	2	
Carlsbad								x	Eddy	2	
Clovis			P						Curry	2	
Deming								x	Luna	0	
Roswell								x	Chaves	2	
Region Totals: Mountain	**2,602,000**	**3,936,000**								**574**	
REGION: PACIFIC											
CALIFORNIA State Totals	**9,108,000**	**10,139,000**								**329**	
Atascadero	6,480†		P						San Luis Obispo	8	
Bakersfield			P					x	Kern	9	
Chico	10,339†		P						Butte	9	
Eureka					F		M		Humboldt	7	
Fresno		136,000	P					x	Fresno	19	
Glendale								x	Los Angeles	42	
Healdsburg								x	Sonoma	9	
Long Beach					F			x	Los Angeles	42	
Los Angeles	3,101,000	3,413,000	P		F	Pr	M	x	Los Angeles	42	
Marysville	17,073†							x	Yuba	4	
Modesto		see Stockton	P						Stanislaus	22	
Mountain View	36,207†		P						Santa Clara	15	
Napa	9,318†								Napa	3	
Oakland (see San Francisco)			P		F			x	Alameda	5	
Ontario						Pr			San Bernardino		
Palo Alto								x	Santa Clara	15	
Pasadena	24,975†		P					x	Los Angeles	42	
Petaluma	184,849†		P								

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This is where continuous line operations pay dividends in a cannery. Cans are carried by conveyors to filling and sealing machines and retorts. Unnecessary handling and waste motion can be eliminated through the proper arrangement of equipment.

Planning Plant Revitalization

About to restore its plant and equipment to meet postwar competition, industry must consider new developments and line operations to avoid unnecessary storage, involved handling and isolated unit operations

By JOHN I. THOMPSON, Consulting Engineer, Washington, D. C.

MANY plants still face the problems presented by five years of deferred maintenance. These problems involve large expenditures merely to restore the plant and equipment to prewar condition. Because of the magnitude of costs involved in doing no more than this, something more than mere catching up on maintenance should be considered. Now is the time to compare the cost of restoration with the cost of complete revitalization. The latter will bring rearrangement of equipment into the most desirable form for line operation and may prove to be the better and sounder course in the face of coming competition.

Undoubtedly changes have taken place in most enterprises with respect to products and their annual sales. Equipment to produce prewar products may be badly out of balance for economic production of postwar products and volumes. Likewise, during the last five years new technics have been developed, especially with respect to handling, thermal applications and finishing. Utilization of these new developments in revitalizing can be the signal for entering into a program of plant and process rearrangement.

Line Operations Preferable

One of the first things to consider is planning for production of each product in a "line operation," as far as possible. Line operation is the arrangement of equipment or process so that the successive steps in producing a definite quantity of product in a given time are in balanced relationship with each other: (1) as to location of each step; (2) as to relative volumes in the process for each step; and (3) as to dependence for performance on any step preceding it. This does not mean operations must be continuous in order to fall into the definition for "line operations." It does mean, however, that unnecessary temporary storage accumulation, involved handling because of unbalanced rates in successive operations, and the location of successive operations remote from each other are to be avoided.

In planning a program of rearrangement and modernization,

application of the latest ideas developed or adapted from the industry or other industries must be made in a carefully coordinated way. A scientifically prepared plan should be adopted. This will avoid isolated unit operations, the erection of which might otherwise be "good enough," but stand out as "monuments" because they do not fit into the flow of materials or because by their very existence they cause unnecessary handling or process steps.

To chart the way through the consequent design-problems, a definite form of approach should be used. This should take into consideration the responsibilities of the several divisions of the enterprise: technological, production, sales, purchasing, and the general management. In examining the specific problem, the first step is to generalize on the "Why," the "What," and the "How" of the whole project. Following this procedure, six steps ensue:

1. The preliminary study. Here determination of the product requirement, its design, sales, etc., is made.

2. Questions to be answered; justification of the job labor wise, material wise, quality-improvement wise; also, is increased production the mission? These two steps determine whether or not the design should proceed, and in what direction.

3. The design study: the listing of unit operations, the volume-time relationships for each, and the standards requirements.

4. Detailed estimates and the determination of the operation details.

5. The design itself and its application. This is the detailed engineering step. Within this step are a series of intermediate steps to be passed in getting satisfactory designs and specifications. The controls needed and the details of these controls, the details of how the whole line will go together and how it will be built are other factors which should be included in this step.

6. The final step is the installation and initial operation of the design. The actual standards to be used by the production personnel are worked out in conjunction with those responsible for the design.

How to Go About It

It is never desirable to stop the engineering approach as the last bolt is drawn tight. Successful operation depends, to a large extent, upon the development of good operating practices immediately subsequent to installation, and in forestalling bad ones.

This engineering approach to the design and installation of a line operation is outlined in the following series of steps tabulated in the sequence found successful in many plant and equipment designs. Each of these steps has indicated the responsibility of the engineer to others in the organization. The importance of whom to get information from, whom to collaborate with and whom to get approval from cannot be overemphasized.

Engineering Approach To Revitalizing Production

In the following outline the symbols used for designating responsibilities are:

GM—General Manager
PM—Plant Production Manager
SM—Sales Manager
T—Technologist
PA—Purchasing Agent

Symbols indicate which officials should collaborate and which should approve. For example, (SM, PM; SM, GM) indicates that sales manager and plant production manager should collaborate with the engineer at this point, while the engineer should seek the approval of the sales manager and general manager before proceeding. Similarly, (PM; GM) means that the engineer should have the collaboration of the plant production manager and the approval of the general manager. Where the symbol "X" appears, no approval is needed.

A. Preliminary Study

1. (SM, PM; SM, GM) Annual volume of product in finished units.

2. (PM; PM) Peak daily volume.

3. (PM; PM) Number of days or percent of total year that production is expected.

4. (PM; PM) Daily average production for the days operated.

5. (SM; SM) Sales curve for year, showing seasonal fluctuations.

6. (SM, PM; X) Quantity of product in stock at each period on sales curve assuming uniform production rate.

7. (SM, GM, T; GM, SM, T) How a nearly uniform production rate can be maintained by study of:

(a) Technical aspects of storage
(b) Raw material supply
(c) Labor supply
(d) Sales and inventory policy.

8. (SM, T; GM, SM, T) Possible changes in product that might effect more uniform production rate.

9. (SM, T; SM, T) Design of product by finding, recording and obtaining approval of record:

(a) Raw materials and their proportions

(b) Objectives as to quality, appearance, flavor, use

(c) Size of ultimate unit (weight, dimensions, shape, etc.)

(d) Size of retail sales unit in terms of ultimate unit

(e) Size of wholesale sales unit

(f) Packaging for (c), (d), and (e) above

(g) Variables desirable, tolerable or possible in (a) to (f) inclusive.

B. Justification Study

1. (PM; GM, PM) Laborwise:

(a) Establish quantitatively, for a convenient unit of production, the direct labor used in all phases of product making, where such labor merely *handles* product, plus that portion of the remaining labor time which merely *positions* product prior to performing an operation or inspection upon it.

(b) Select such integral unit operations where known machines will perform as well or better than manual labor, e. g., substitution of a motor-driven mixer in a kettle previously hand-stirred with a paddle. Then establish the quantity of this labor.

(c) Subtract the labor charge arrived at under (a) and (b) from the known labor charge. Then, for instance, if the unit of production upon which these were based is a nominal figure for one day, multiply by the number of days indicated to obtain the annual *potential* gross labor saving. The resulting figure, converted into dollars, will determine the advisability of proceeding further if only labor saving is the justification.

2. (PA, T; T) Material wise:

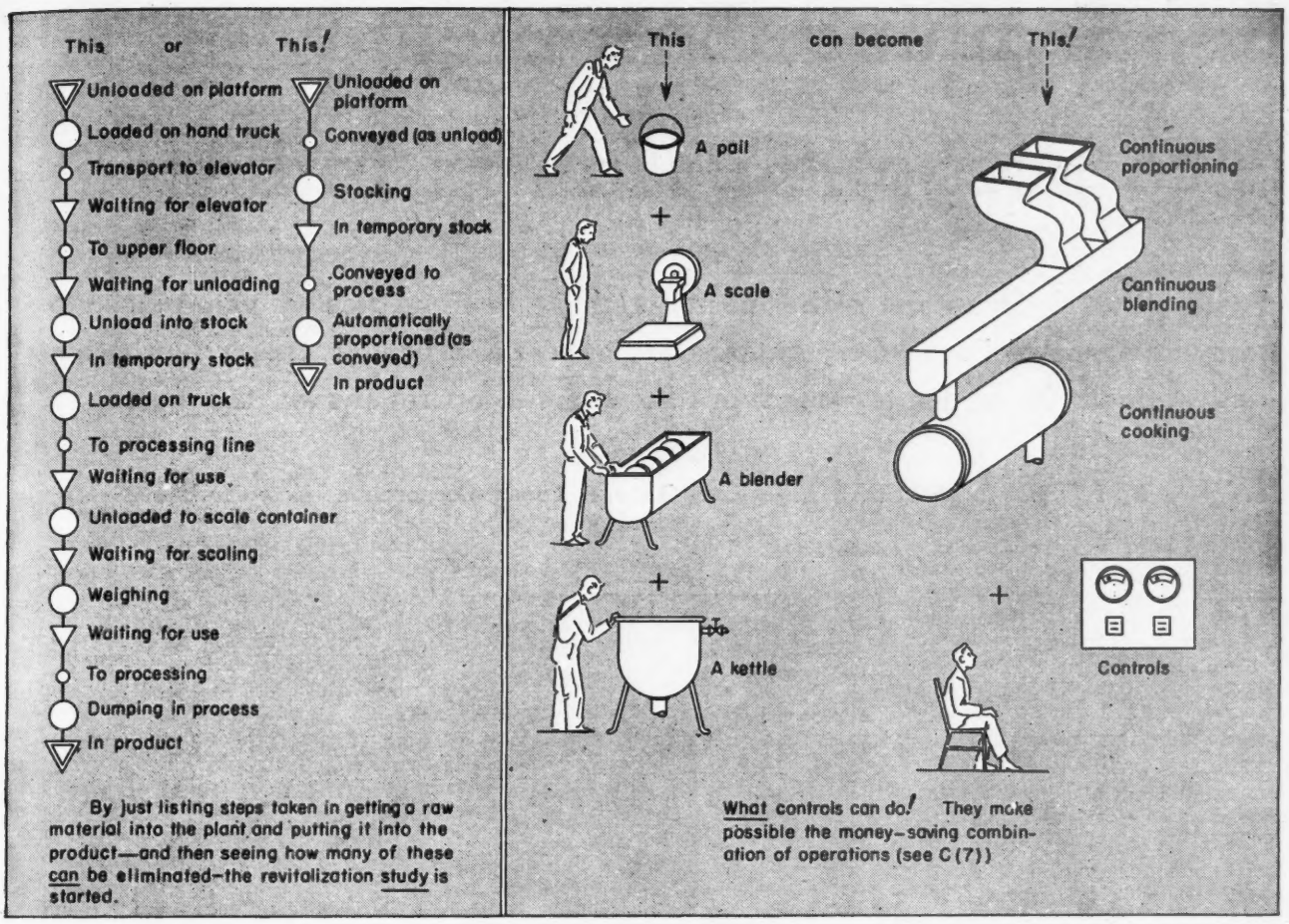
(a) Comparison of total raw material, less theoretically minimum losses, with current actual yields, for the whole, and for each unit of each raw material, checking more expensive ones for "transmutation" with or into less expensive ones.

3. (SM, T; SM, T) Quality-Improvement Wise:

(a) Obtain some sum representing the value of a quality improvement potentially possible.

4. For increased production:

(a) Accurate analysis of *current*



production costs; hence, setting up a "limit cost."

C. Design Study

1. List unit operations, *in reverse order*, starting with finished packaged unit of each size, etc.

2. Group operations carried out at one place, or where they are necessarily continuous steps with fixed or limited time elements between.

3. (T; X) Make a process flow diagram for each group, or for single isolated operation where they are not in preceding group 2.

4. (T; X) Establish area conditions for each group.

5. (T; X) Establish product process (thermal combining, synthesizing, or otherwise) within each group or single operation.

6. Establish volume-time relationship at each grouping or single operation in terms of finished product rate of production.

7. (T; T) With 1-7 inclusive (above), study them for possible combining and/or simplifying as:

(a) A thermal and a blending operation

(b) A thermal operation and a physical transfer to the succeeding operation

(c) A milling and mixing or blending operation

(d) Analytical or assembly operations, as simultaneous labelling and capping.

8. (T; T) Study 7 for operations to be eliminated or changes in product (within permissible limits) that will eliminate operations and for steps, either added or eliminated, that will improve product.

9. (T; X) set up uniform standards for product at each operation, with minimum limits, that in each succeeding operation affect uniformity of size, or of pieces, permitting ultimate handling in "pieces" continuously into "packages" by machine. This is done by taking the reverse order of operations and establishing tentatively the most desirable specification at each step, then investigating the previous step for the possible achievement of the specification.

D. Preliminary Design for Cost and Operation

1. (PM; GM) General space reservation for each phase, *in reverse order*, as: warehouse, finishing (labelling, casing, etc.), etc.

2. General layout within each space, in reverse order.

3. Equipment itemization for each space, whether standard, designed, or to be designed.

4. Spotting location of operators and operation points, as estimated.

5. (PA; X) Cost estimates for "furnishing and installing," broken down as to groups of operations, or single operations as defined in (C) design study above.

6. Cost of operating, broken down in the groups under 5.

7. Determination of economic comparisons for each step.

8. Study of these in connection with results under C 9 above.

9. (GM, PM; X) Final estimate of cost and justification for project.

10. (PM, T; X) Proposal for detailed operation of line to be designed.

E. Design

1. (PM, T; X) Establish work places, operating points, inspection points from viewpoint of operator facilities.

2. (PM, T; X) Establish line, machines, service connections, from 1, as nearly as possible.

3. Detail all operation-performing equipment (standard or previously designed).

(*Continued on page* 190)

Training the Executive—
The Forgotten Man in Industry*

Feeling that the manager of business had long been neglected with regard to training, General Foods Corporation developed an executive training program and trained 80 of its top men in the over-all operations of the company

By AUSTIN S. IGLEHEART, President General Foods Corporation, New York

WE HAVE in our company about 80 men whom we consider as general managers. They either manage a business, or they manage a very important part of it. Most of these men have come up to their present responsibility through one department, and although they may have been good as sales managers, for example, these questions arise when someone proposes that they become general managers: What do they know about manufacturing, or about law, or about finance, or any of the other problems?

Executive Training Conceived

To overcome these deficiencies, and to see if we could develop a better experience for managers, an executive training course was instituted. Where did we get the idea? During the last war I spent some time in connection with the war effort, and was amazed at how the Army could develop a program, and develop men with the rapidity with which they did. I was curious as to how they accomplished it, and upon investigation I found the answer—7,500 of the 12,000 officers in the Army prior to 1938 had spent one or more hitches at the War College. While there they studied, not only the problems of their own specific branch, but gave deep study to how their activities fitted into the other parts of the Army. That is where the idea came from.

During the war, the Army picked up everything they could from industry and applied it in the training of people. Now we can go back and pick up the collection of information, technics and devices that the Army used so ably and apply them to our problems.

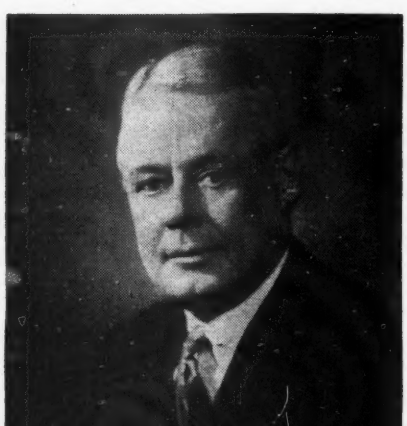


Photo by Bachrach

Austin S. Igleheart, president of General Foods Corporation, the author, didn't look at the cost when he started training courses for his general managers.

My associates thought the idea of an executive training course worth exploring, so we took two of our very capable men and asked them to find out what was known about management. The first place they went was to the library. There they found rows of books on management. They went to the Grocery Manufacturers' Association, to the National Manufacturers' Association, then to the National Industrial Conference Board where they uncovered reams of publications all ably and well prepared. They went to the universities to discover what courses were given in management. From these sources we collected and put together what we used.

I don't think that you can talk to people and teach them. Perhaps they can't even talk among themselves and teach themselves. But at least they can learn something out of the technic of conference, so we set up conference meetings for the 80 people in our company who we thought should have a broader experience in the area of management.

How It Operates

They met in New York hotel rooms one week out of every six. From 12 to 15 of these men engaged in various kinds of activities. We didn't take all salesmen for one meeting or all production, or financial men for another. We mixed them up.

What did they talk about, or what was taught to them? Again I can give you only a sketch of what took place in the period of four weeks, remembering that each week of classes was six weeks apart.

The first day of the meeting was on conferences, because management spends most of its time in conference, and we in General Foods believe in talking over with those members who are to be affected by decisions, those decisions that are to be made. The second day was devoted to planning, the third day, to organization. On the fourth day, control was discussed and on Friday, coordination. That comprised the first week.

Now, these men are just as capable in management as we have been able to select. They sat down and discussed the problems mentioned in this first week, after having had a talk about the various subjects each day. During the next three weeks we tried to show them how each department in the business was organized and operated, and

*From a talk given at the 38th annual meeting of the Grocery Manufacturers of America, Inc., New York, November 18, 1946.

how it fitted into the other departments of the business.

So the second week the manufacturing manager's job was explained for a full day. The second day was work measurement and work simplification. Wednesday, was sales and manufacturing. Thursday, was employees evaluation. Friday, was history of collective bargaining.

In the third week: research and development, one morning. Purchasing was on the second, and law on the next day. Thursday, was sales, and Friday, traffic.

The fourth week was finance and administration, how the comptroller's department worked and how it can assist management to earn and retain profits. Tuesday, the treasurer's job. Wednesday, advertising. Thursday, the new tax department. Friday, publications.

About Controls

Now, that is just an outline of subjects, but I thought perhaps the one day's work in which you might have the greatest interest would be that day devoted to controls. We have been squawking about controls from Washington for the last few years, and it looks as if most of them are gone. So the job is back in our laps—control.

The manager's major job is first to control what he has, but the second and probably the most important part of his job, is to look for and find an opportunity for improvements. If you are only going to run your business like a chauffeur runs an automobile, you need only a chauffeur to run it, but if you are going to build a new business or keep it up, or improve it, you need higher brains; so the manager's major job is to first find an opportunity; second to analyze that which he finds that he wants to improve; third, draw plans for improvement; fourth, staff and train those who are to carry out the plan; last—and important—check. Now that, as we see it, is the manager's job. First, control what you have. Second, find out how to improve and do something about it.

Four Levels

If you are going to control, the first thing you have to control is yourself — self-control. Obviously you can't control other elements, particularly other people, without starting with self-control, and the question which you have to decide for yourself on the matter of control—controlling your own job, now—is at what level do you wish to work? There are four levels.

The first level is administrative, or the policy and planning level. Is that where you want to work as a manager?

The second is the executive level —directing of operations of assistants. Is that the level at which you want to work?

Third — supervisory — directing the activities of workers. And fourth is the worker level, doing detail operations.

So, first, you must analyze your job, and decide at what level you want to operate, following which, you must analyze and diagnose your own business or department or job and see it as a whole as the doctor sees you when you go to him and the ticker is on the bum. He doesn't look just at the ticker. He looks at a lot of other things. Look at your own business and analyze it.

Analyze it for: First, policies; second, organization; third, personnel; fourth, facilities; fifth, methods. Then go a little further as to the divisions of the business and apply these areas of analysis to the departments of the business. In other words, as to the sales, what are the policies, the organization, the personnel facilities and methods? As to the purchasing, the same thing; and then production.

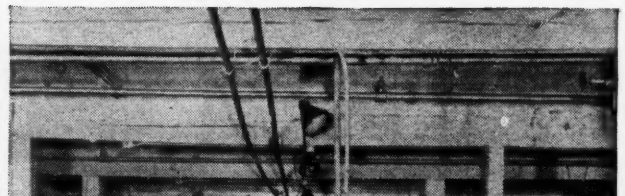
Then you get down into the sales department, using that as an indication of what should be done with each department, and analyze again for the policies as they apply to production, as to customers, channels of distribution, prices, terms, sales appeal, sales solution and promotion.

The object of analysis is to get the facts. And why do we want the facts? For control. This is all related to control. We are looking for handles to control. You must have a handle. If you are driving a train, you have a throttle in one hand, probably the air brake in the other and maybe a dead man's brake under your foot. Driving an automobile involves another con-

(*Turn to page* 196)

This is a typical senior staff group attending one of the General Foods Conferences for Executive Development held in New York hotel rooms. Some 80 top officials attended training sessions that met every six weeks for a week, four sessions in all.

Candling tables are located below the conveyor carrying fillets from cutting room. Flumes are close beside candling tables in a location convenient to operators. Fillets are placed on a translucent pane on the candling table. If they show no defect, they are then dropped into the flume. Those showing defects are carefully trimmed and then dropped into the brine flume.



Flume System Aids Brining And Siruping Operations

Gorton-Pew uses this installation to clean, chill and brine fish fillets. Operation is sanitary, continuous and applicable to many kinds of food. The equipment can be adapted for washing vegetables and siruping fruits

By M. P. VUCASSOVICH, Technical Director
Gorton-Pew Fisheries Co., Ltd., Gloucester, Mass.

A SIMPLIFIED method and apparatus for conveying, washing, brining, siruping and precooling food products for freezing and preserving has been invented by the writer at Gorton-Pew Fisheries Co., Ltd. This invention eliminates belts and mechanical devices required by conventional brining and conveying equipment. The apparatus can be used to wash and precool as well as brine. It simultaneously cleans, chills, and brines or sweetens by taking advantage of fluming with water, brine or liquid sugar sirup. Thus berries and fruits can be siruped prior to freezing. Washed, brined or siruped food products are elevated from a water, brine or sirup tank by a conveyor to a weighing and packing table.

To appreciate the advantage of this versatile apparatus, it should be compared with some of the well-known methods of brining or pickling foods. Some of these are continuous and others are intermittent. These brining methods include: (1) sprinkling salt on foods, (2) immersing foods in brine, and (3) conveying food products through brine with the aid of single or double belts. These general methods are more or less satisfactory, but they do have certain disadvantages. With the new device, however, many disadvantages are eliminated. Sanitary conditions are improved. There are no long conveyor belts requiring cleaning. The apparatus can be cleaned simply and rapidly by circulating hot water and detergent and disinfectant solutions through the tank and flumes. Precooling facilities keep down spoilage bacteria. Recontamination of products is minimized, and the temperature of foodstuffs may be lowered to about 32 deg. F.

The processing of rosefish fillets is an example of the way the flume method works. Fillets are cut from the whole fish and conveyed to the inspection and brining table,

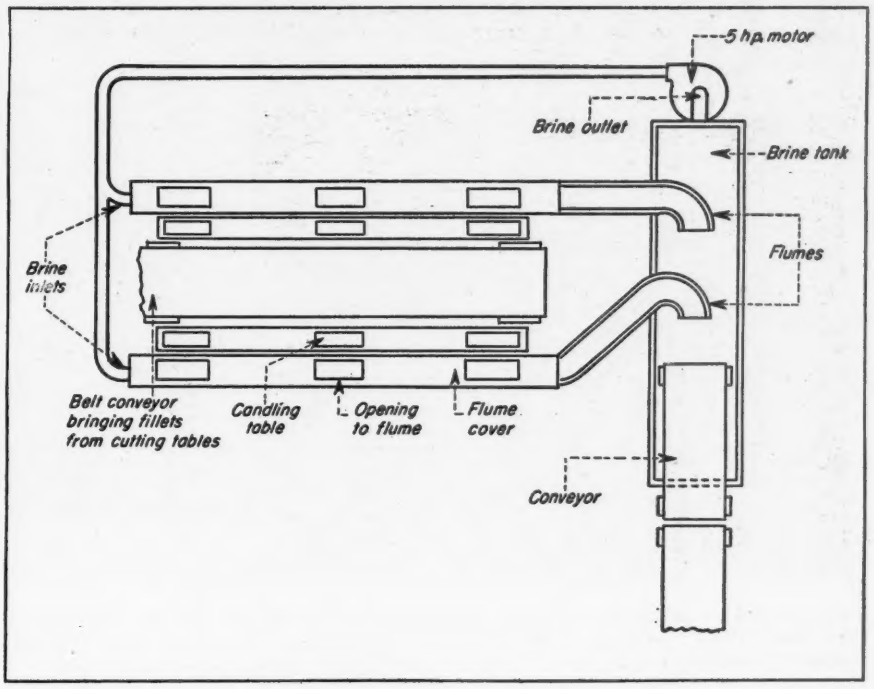
equipped at each side with flumes. Operators remove fillets from the belt conveyor and inspect them on a translucent pane on the candling table for parasites, blood clots, bruises and other defects. Fillets are trimmed if necessary, then dropped into the flumes. Flumes are built on a slight incline and extend beside and slightly below the candling and trimming table. The top of the flumes may be either open or covered; covers if used have slots at each operator's station. Fillets are vigorously tumbled, washed and brined in the flumes by the high velocity of the brine. Loose scales, slime and other debris are washed from the fillets. At the discharge end of the flumes, brine and fillets flow lengthwise into the brining tank in the direction of the conveyor.

Brine Tank

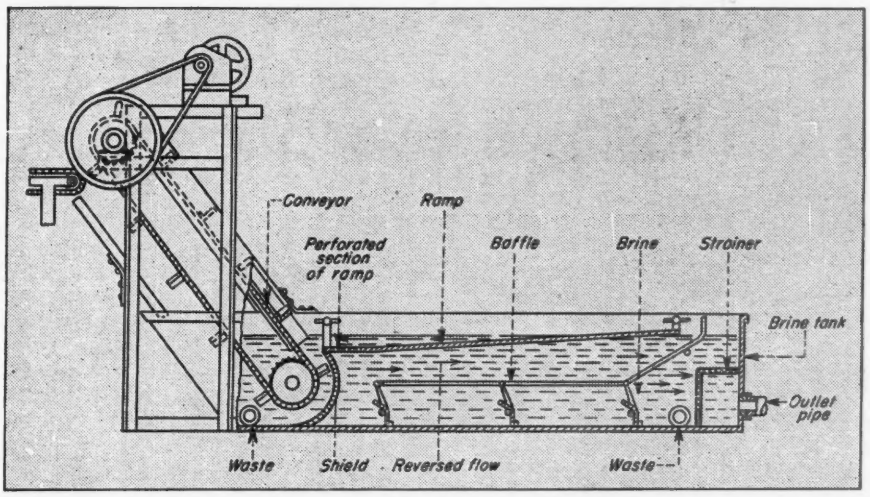
The level of salt solution in the brine tank is regulated, to avoid overflow resulting from the turbulence created by brine flowing from the flumes. Constant brine circulation is maintained through the tank and flumes by a pump with a 5 hp. rheostatically-controlled motor. Brine flow is regulated at a rate varying from 50 to 200 gal. per minute.

In the upper part of the tank an inclined, stainless steel baffle plate separates incoming brine from brine in the lower part of the tank and reverses its flow. Its forward end is slightly above the liquid level of the tank, while more than half of its back end is below the surface. Reversal flow, created by the baffle, prevents fillets from sinking in the forward part of the tank, and carries them to the conveyor. The baffle also stops counter current brine flow through the outlet from opposing the travel of the fillets.

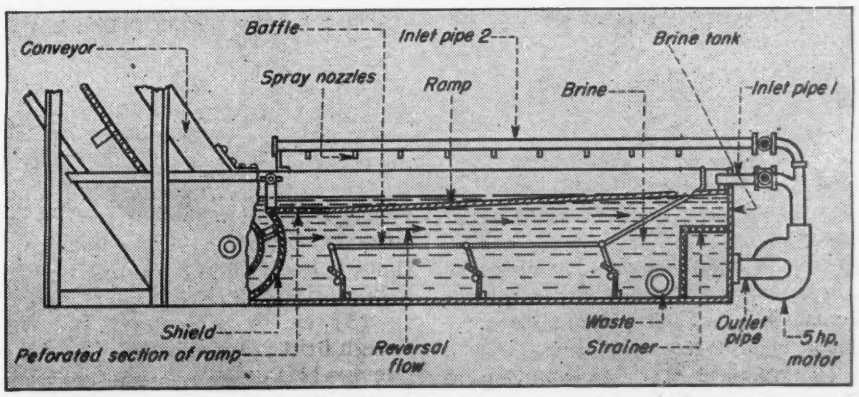
A perforated, stainless steel shield extends from the end of the ramp to the bottom of the tank. It occupies the width of the tank and keeps fillets that fall off the ramp from being carried away from the conveyor by the counter current flow of brine. Also, a series of baffles, mounted on the bottom and extending across the width of the tank, prevents slime, scales and fish debris from clogging the strainer. Baffles are removable so that collected sediment may be washed away when changing the brine. A strainer is mounted at the front end of the tank around the entrance to the outlet pipe. Drains are installed at the bottom of the tank to empty the



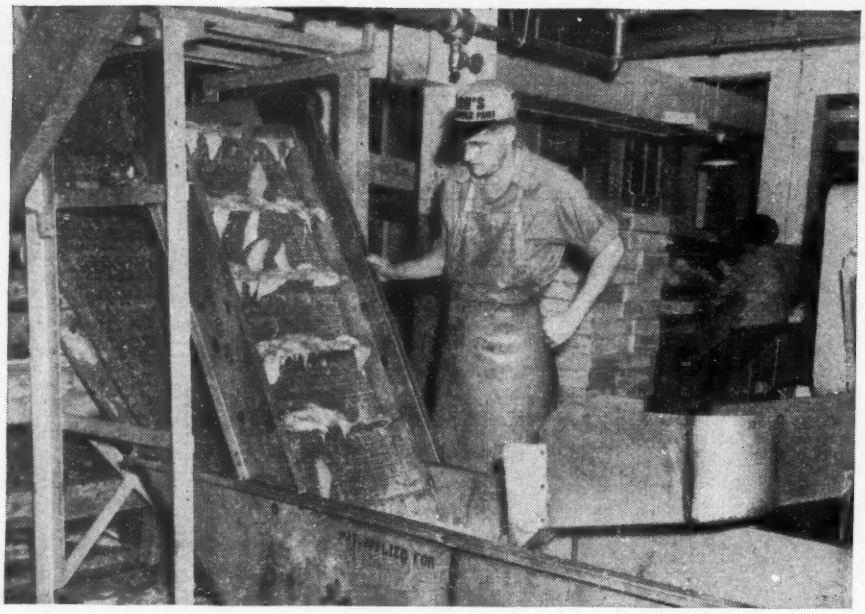
Diagrammatic view of combined apparatus used for conveying rosefish fillets from the cutting tables in the filleting room, candling for parasites and other defects, brining in flumes and brine tank, elevating from brine tank and depositing on packing table.



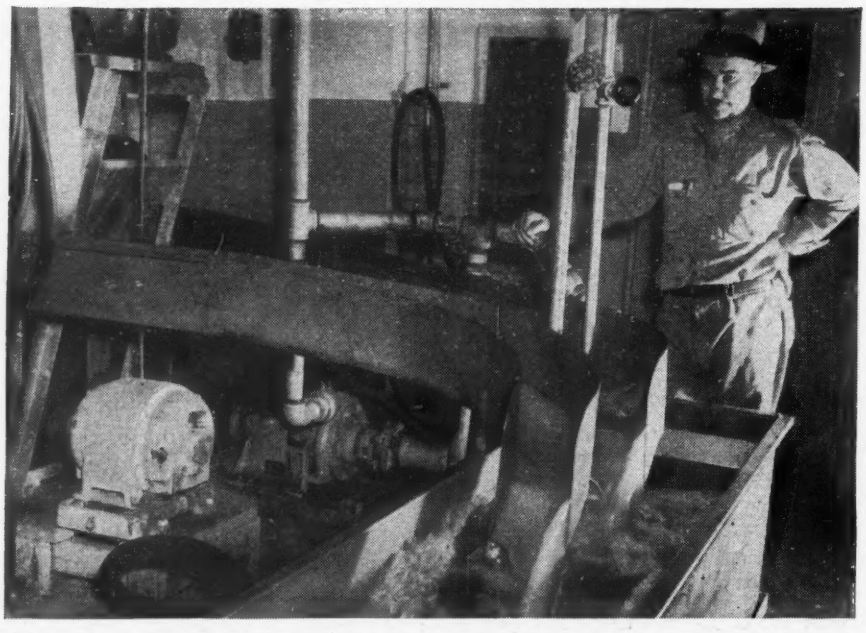
Brine is circulated through the tank and flumes by a pump connected to a pipe in the front end of the tank and discharged into a pipe leading to the flumes. Brine flowing in flumes carries fillets to brine tank where conveyor elevates them onto packing table.



A modified food brining apparatus in which the flumes are eliminated and brine is withdrawn from the brine tank by pump and returned by pipes 1 and 2. Pipe No. 1 discharges brine lengthwise and Pipe No. 2 sprays brine down into the tank.



An inclined conveyor, with its lower end mounted in the rear section of the brine tank, elevates brined fillets and deposits them onto a weighing and packing table. The conveyor has stainless steel slats secured to chains that engage sprockets in the tank.



Terminals of the flumes are disposed so as to discharge the brine flowing through them lengthwise into the brine tank in the direction of the elevator conveyor at the far end of tank. Flow is regulated by a pump with a 5 hp. rheostatically controlled motor.

tank when the brine requires changing.

Changing the Brine

Generally, the brine is changed every two hours and the strength of the brine is built up periodically. But the frequency of changing the brine depends on the thoroughness of washing and the quantity of fillets brined in a given time.

Fillets may be chilled to 32 deg. F. by fitting refrigerating coils in the lower section of the tank. Where refrigerating coils are not used, ice may be dumped into the tank and replenished as it melts.

An inclined, flight conveyor is mounted with its lower end immersed in the rear part of the tank. Fillets, passing to the conveyor from the ramp, are elevated from the brine tank and deposited on the weighing and packing platform.

Modified Apparatus

There are other means of continuously withdrawing and circulating the brine. For example, brine may be withdrawn from the tank and returned through two pipes. Brine may be discharged from one pipe lengthwise across the tank over the inclined baffle. The other pipe, extending lengthwise over the baffle, is fitted with a series of nozzles through which the brine is sprayed. The pipes may be used together or separately. Food to be brined can be loaded on the baffle from conveyors, containers or by other suitable means.

TABLE I—Percentage of Salt Absorbed by Fillets Immersed in Different Brine Concentrations Over Varying Lengths of Time.

Brine conc., percent	Time in brine, sec.	Salt content of fillets, percent
..	..	0.58
15	5	0.76
15	10	0.62
15	15	0.67
15	20	0.72
15	25	0.71
40	5	0.97
40	10	1.00
40	15	0.97
40	20	1.00
40	25	1.10
40	30	1.10

Brining Period

Laboratory tests show that the amount of salt absorbed by fillets is influenced by the concentration of salt in the brine. The greater the salt concentration, the greater the amount of salt absorbed by the fillets. In commercial practice, brine with 12 to 14 percent of salt is used. With a given salt concentration, however, absorption of salt by fillets is almost the same over a 5- to 30-second period of contact. Consequently, there is no material difference in the amount of salt taken up by fillets dropped in flumes at varying distances from the tank. Similarly, the rate of brine flow does not influence the amount of salt absorbed by the fillets.

Other Applications

All foodstuffs that may be benefitted by washing, brining or siruping as a step in their preparation may be treated in this apparatus. Split whole fish, fillets, shrimp and mollusks such as shucked oysters, clams and scallops may be washed and brined. The same treatment may be given to pieces of animal meat, crabmeat, lobster meat and vegetables. With this device berries and sliced, halved or whole fruit may be either washed with water or siruped with liquid sugar sirup.

The turbulence of water or brine in the flumes separates any sand and bits of shell adhering to shucked oysters and clams. The meats can then be drawn from the tank by the conveyor where water or brine is drained away.

Using Air Filters In Food Processing Plants

Air-borne microorganisms in food processing plants can be controlled by the installation of air filters in the ventilating system. The two most satisfactory types are mechanical and electronic filters

By ARTHUR NUTTING, Chief Engineer
American Air Filter Company, Inc., Louisville, Ky.

SINCE 1922, the value of air filters in controlling air-borne organisms in food plants has been increasingly recognized. Powdered milk manufacturers have found that, by installing bacteria filters they were able to make a product which would withstand severe climatic conditions. Meat packers have completely eliminated the problem of moldy bacon by the installation of bacteria filters in the air inlet ducts of their slicing rooms. A large producer of nut butter installed filters of the viscous impingement type with the result that he reduced the mold spore count in the air of his drying room by 99.6 percent. In this particular installation (Fig. 1) the filters were installed, not only in the plenum chamber at the air intake, but also on the duct outlets in the drying room. This technic prevented the entrance of spores into the duct when the fan was shut down.

The first proof that at least some air-borne organisms could be controlled by the use of mechanical air filters came about 25 years ago, when the U. S. Gelatine Co. installed filters in some of the drying tunnels at their new plant. The result was the production of photographic gelatine equal to, or superior in quality to that previously imported from Holland.

Sampling Technics

Development of bacteria filters was impeded by the lack of proper sampling and testing technics. In the late 30's, however, J. M. Dalla Valle and Alexander Holleander[1] developed, at the U. S. Public Health Service, a method that has proven satisfactory for determining the ability of filters to remove certain bacteria from the air. In this method (Fig. 2), bacteria are introduced in a fine diffuse spray at the fresh air inlet. Samples of the air, before and after filtration, are passed over a 3½ in. Petri dish (Fig. 3) containing nutrient agar, for a 3-min. period. Exposed plates are incubated for 48 hours at 37 deg. F.

Results of a series of tests by Dalla Valle and Holleander, using *Bacillus subtilis* to determine the efficiencies of various filtering materials in mechanical air filters, are given in Table I.

Another method, that has been used for air sampling, is the Wells Air Centrifuge[2]. It is made up of a centrifuge head, which consists of a one-piece aluminum cylinder and fan, that rotates on a ball bearing secured to a stationary air intake tube. It is driven by a small vertical electric motor at speeds varying from 2,000 to 4,500 rpm. The centrifuge is enclosed in a casing equipped with a detachable luggage handle, and can be used wherever electric current is available. In operation, 20 to 25 ml. of melted nutrient agar are poured into a sterile, specially designed, Pyrex tube which is immediately inserted into the centrifuge head. The centrifuge is started and run for approximately 10 min. during which time a thin film of the agar is spread over the entire inner surface of the tube. The centrifuge inhales air in the top, whirls it around and tosses it against the agar in the tube, then exhausts it through the exhaust vent in the side. Bacteria are collected directly on the hardened agar while the air is being drawn through the tube. At the end of the run the tube is removed, sealed, taken to the laboratory and incubated one to two days, after

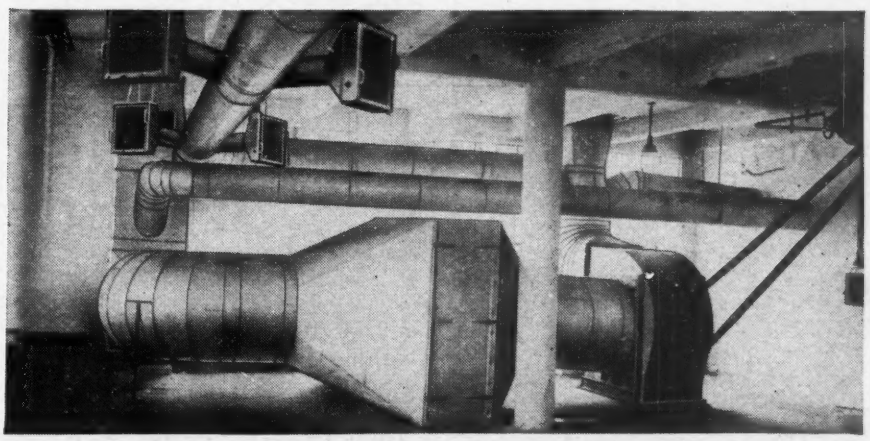


Fig. 1. Double filtration as applied by a large nut butter manufacturer to eliminate mold spores from the air in the drying room. Filters were installed on the outlets of overhead ducts to prevent entrance of spores when fan is shut off.

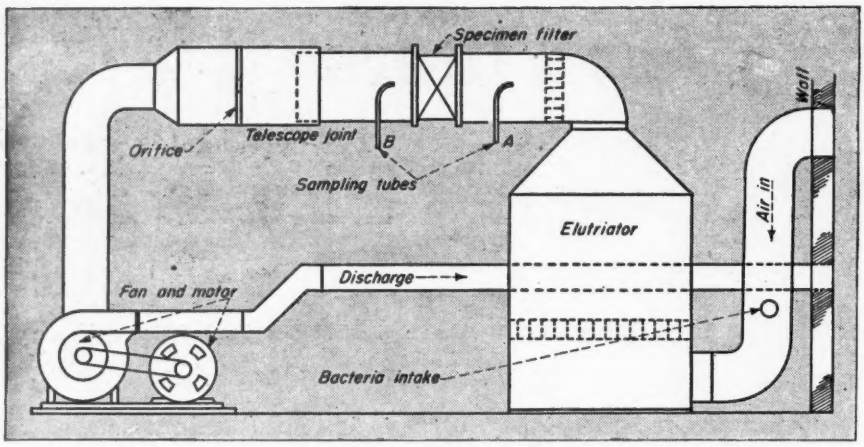


Fig. 2. Apparatus used for testing mechanical air filters by Dalla Valle and Holleander consisted of an elutriator for settling out large particles, an adaptor for installing filters of different construction, an orifice for gaging air flow, an air flow regulating damper and a constant feed blower fan. Samples of air, before and after filtration, were obtained from sampling tubes A and B respectively.

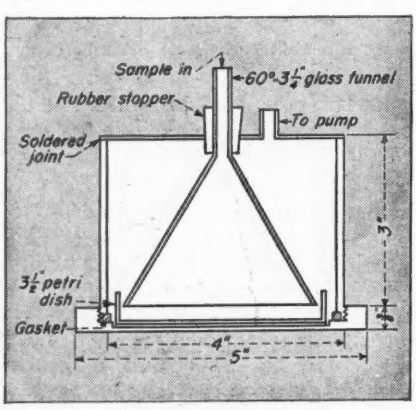
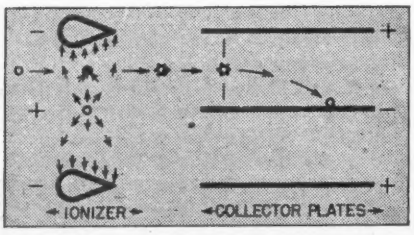


Fig. 3. Device for sampling air-borne bacteria used by Dalla Valle and Holleander. It consists of a brass cup fitted with a 3-in. inverted glass funnel that fits into a Petri dish containing nutrient agar.



which time the colonies have developed enough to be ready for examination.

Other Air Treatments

With the development of satisfactory technics for sampling the air in ventilating systems new methods of reducing air-borne bacteria have been introduced. Three of these now being used are—Ultra-violet radiation, chemical germicides and electronic filters.

ULTRA-VIOLET RADIATION is effective against many types of bacteria, but its value in the commercial production of super-clean air is open to some question. Its effectiveness depends upon the intensity of radiation, wave length, and the duration of contact with the bacteria. In working areas it must be used in a concealed location because of its effect upon the eyes and skin. When inserted in an air supply duct, the air must be allowed to move very slowly and all of the bacteria must remain in the radiant field long enough to be destroyed. This calls for an unusually large air chamber within the system, or the use of existing air supply facilities at much less than their rated capacities. Furthermore, very intense fields of ultra-violet radiation produce ozone, and ions which attach themselves to dust and water nuclei causing them to remain in suspension longer than if they were not so charged. Dust deposits on lamp surfaces substantially reduce the efficiency of the radiation and can effectively shield bacteria from the ultra-violet rays.

Fig. 4. (Left): Schematic drawing of electronic air filter. Dust particles take on positive charge while passing through the ionizer and are attracted to negative plate.

CHEMICAL GERMICIDES are not entirely effective against many types of bacteria that menace the food industry. At present, their use is considered practical only in medical applications for breathing purposes.

ELECTRONIC FILTRATION of air is a method of removing entrained solids from gases by means of electrical attraction. It is based on the principle that an electrostatically charged particle will be attracted to a charged electrode of opposite polarity, and repelled by one of like polarity. Thus, its efficiency is not influenced by the weight or mass of the particles as with mechanical filters which depend upon impingement or straining action to remove the particles from the air stream. It has, therefore, extended high efficiency removal into the range of fractional micron (1/25,000 inch) sizes with its capacity to remove particles of tobacco smoke (approximately ¼ micron in size), and mold spores, bacteria and other micro-organisms that range in size from 0.5 to 2 microns.

Electronic Filter Equipment

A conventional, ventilation-type electronic air filter may be thought of as two pieces of equipment—an ionizer and a collecting assembly. In the ionizer, which consists of fine wires equi-spaced between parallel electrodes, the particles are given a positive electrical charge. This is accomplished by the use of a power pack (Fig. 5), in which low voltage alternating current is transformed to high voltage, then rectified to direct current. The ionized particles proceed to the collecting unit, which consists of a series of parallel plates, alternately charged positive and negative.

TABLE I—Results of Mechanical Filter Tests Using B. subtilis (Hay Bacillus) Average Size: 2 Microns

Tests No.	Type of filter	No. of tests	Average colonies per cu. ft.	Efficiency percent	Remarks
1.....	Felt cloth	6	71.5 ± 12.9	63.5 ± 6.5	
2.....	do	6	42 ± 9.8	67.3 ± 6.5	
3.....	6-ply Airmat*	3	76.0	71.4	Treated with oil
4.....	do	8	92 ± 30.7	74.8 ± 5.6	Treated with oil
5.....	10-ply Airmat*	8	78.6 ± 25.0	75.5 ± 8.0	Treated with oil
6.....	Viscous impinging paper	7	38.5 ± 5.1	69.3 ± 10.3	Treated with grease
7.....	Steel wool (3 in.)	7	20.5 ± 2.1	82.9 ± 7.6	Treated with germicidal oil
8.....	do	8	26.3 ± 7.0	85.4 ± 9.5	Treated with germicidal oil
9.....	Steel wool	3	40.7	77.6	Treated with germicidal oil
10.....	do	8	31.9 ± 10.3	73.5 ± 12.6	Treated with germicidal oil
11.....	Glass wool	7	27.6 ± 2.9	66.5 ± 11.2	Oiled
12.....	Glass fabric	6	72.7 ± 8.1	32.6 ± 8.3	
13.....	Animal hair	8	26.4 ± 5.3	45.8 ± 12.3	

*A cellulose filtering medium made by American Air Filter Co., Inc.

TABLE II—Microbiological Tests of Air Before and After Passing Through The Electro-Matic Air Filter

Source of sample	No. of tests	Average colonies per 100 cu. ft.
Laboratory (unfiltered)	2	645
Electronic filter (filtered)	5	0
Recirculated air	2	370
Electronic filter (vent. system)	2	0

Here the charged particles are repelled by the positive and precipitated on the negative plates. The negative plates are coated with a viscous material to hold the particles mechanically after their electrical charge has been dissipated to the ground. Two types of collecting units are in use—self-cleaning and those featuring removable collector plates.

In the self-cleaning electronic filters (Fig. 6), collector units consist of two sets of plate assemblies —the positive which is stationary, and the negative which is mounted on endless chains that rotate to form a continuous curtain. The lower part of this curtain is submerged in an oil bath through which it rotates to remove dust deposited on the plates.

Two types of removable collector plate units are available—cell type and dry type precipitators. In the cell type precipitator (Fig. 7) the collector element consists of closely spaced parallel metal plates. Alternate plates are charged and grounded to maintain a strong electrostatic field. The plates are coated with a viscous medium that holds the precipitated particles. Periodic washing and re-oiling is accomplished in the filter, or by removal of the cells to a special cleaning tank.

The dry type precipitator combines both electronic and mechanical filtration in a single unit. The collector element is an electrostatically charged paper folded in deep pleats (Fig. 8) to increase the ratio of filtering surface to frontal area. It is supported on insulated grilles which contain the charged and grounded electrodes. When the paper has accumulated a dust load it is replaced with clean material.

Filter Efficiency

In 1939, chemical engineers from a large Mid-Western brewery conducted a series of tests at the plant of the American Air Filter Co., to determine the effectiveness of electronic air filters in removing wild yeast spores from the air stream. Two separate, fully automatic, electronic air filters were used—a small one maintained for experimental purposes in the research laboratory, and a large two-section installation in the office air conditioning system. The test apparatus used was the Wells air centrifuge, the culture media dextrose agar, and the incubation period 72 hours at 28 deg. C. Both filters were operated at their normal capacity rating. Results of the tests are shown in Table II.

The filters used in this test combined the self-cleaning principle with the electronic method of removing particles from the air. *Photographs used on this page, and on page 91 of this article were supplied by American Air Filter Company, Inc.*

References

1. Public Health Report, vol. 54, No. 17, April 28, 1939. U. S. Government Printing Office.
2. E. Phelps and L. Buchbinder, "Studies on Microorganisms in Simulated Room Environments: I. A. Study of the Proficiency of the Wells Centrifuge on the Settling Rates of Bacteria Through Air," *Journal of Bacteriology*, vol. 42, 321-344, September, 1941.

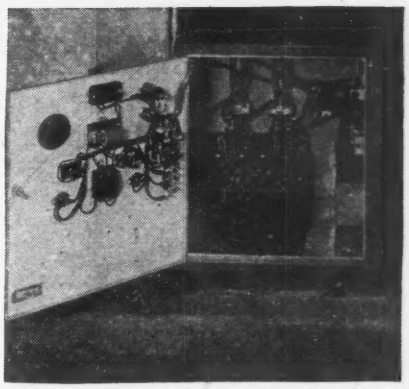


Fig. 5. Power pack of an electronic filter. By means of transformers and rectifier tubes, 115 v. 60 cycle a.c. is converted into d.c. of the required voltage.

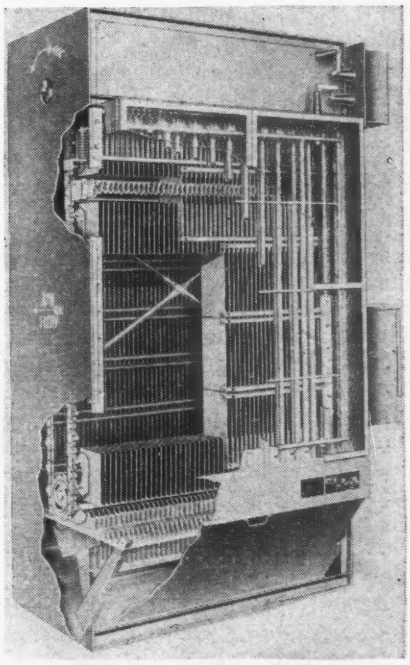


Fig. 6. Cutaway view of self-cleaning electronic filter showing negative plate assemblies mounted on endless chains and oil bath for continuous dirt removal.

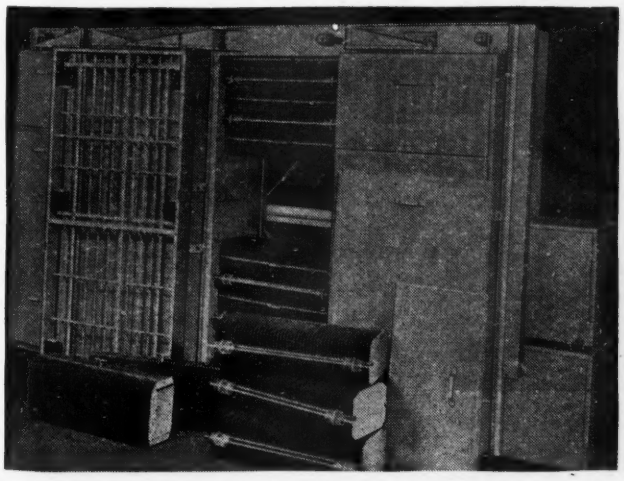


Fig. 7. Cell type filter with ionizer swung back to show how collector plate assemblies slide out for cleaning and oiling.

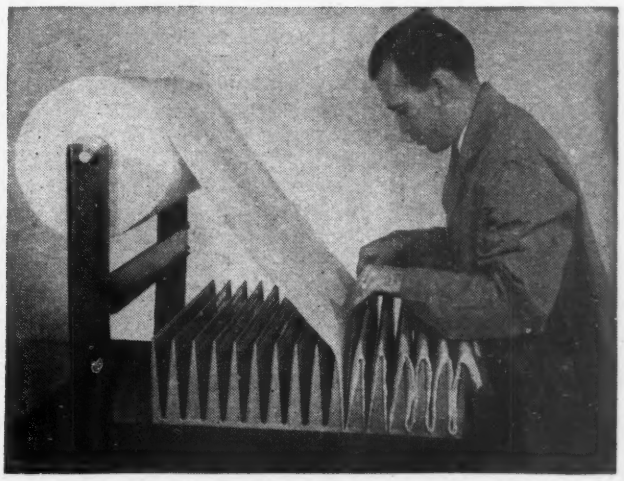


Fig. 8. Replacing the cellulose product, that is used in place of plate assemblies in the Airmat dry type precipitator.

Market Research Reveals Pitfalls When Sales Decline

Study of data on marketing trends shows what happened to substitute products and convenience items during the war. Similar research shows what to expect, what to do and what not to do when the anticipated business recession arrives

CORRECT interpretation of consumer buying trends will help plan production, regulate inventories and act as a steadying influence in sales efforts, when the expected business recession arrives. This is the contention of Arthur C. Nielsen, president of A. C. Nielsen Company, leading market research service.

Mr. Nielsen set forth his views on the current business situation and on the necessity of recognizing market trends, in a paper read at the meeting of the Grocery Manufacturers of America held in New York in November. This paper, with the title "Postwar Trends in Food Marketing," is presented here in part and in condensed form. It includes a 6-point postwar food marketing plan, which is given as completely as space permits.

Among factors that food manufacturers and distributors must take into account are two general axioms. One is that, where increases in processed food production exceed established population increases, it is reasonable to expect a decline to near former levels. Likewise, a drop in consumer income will usually mean a drop in grocery sales, although the drop in sales is less than the drop in income.

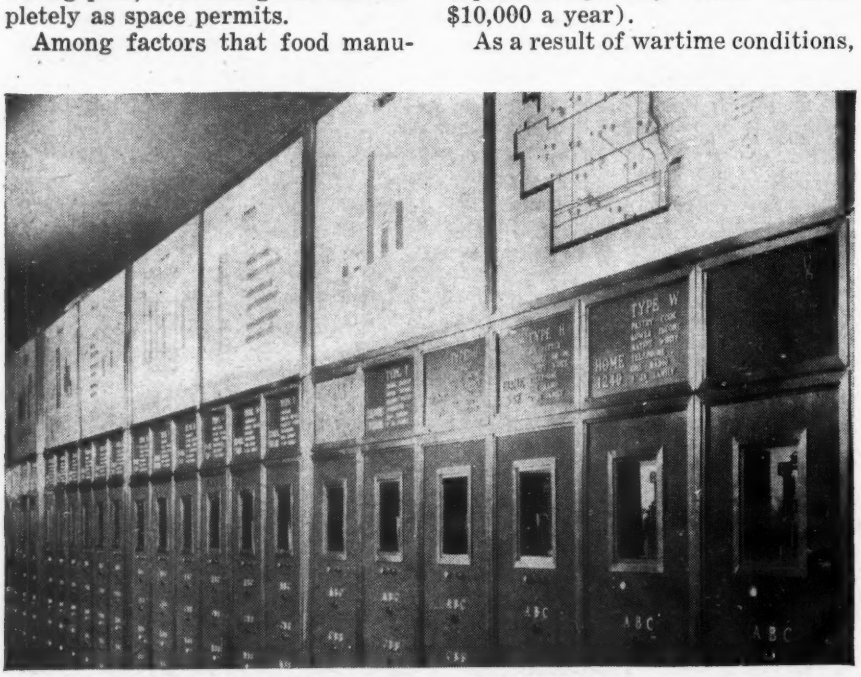
Food production has continued at a rate slightly greater than the average of the war years, and food prices have been maintained at substantially the same level as prewar prices. At the same time, changes occurred in food retailing during the war period, with the greatest percentage retail sales volumes taking place in small independent grocery stores (under $10,000 a year).

As a result of wartime conditions, consumer buying habits have also changed. Margarine sales have doubled. Sales of ready-to-eat and hot wheat cereals have shown appreciable increases. Coffee consumption is now 30 to 40 percent above prewar levels, despite an ever increasing price trend. Several large food manufacturers have successfully marketed dry-soup mixes, and ten times as great a tonnage of fresh vegetables was dehydrated, as was quick frozen.

Outstanding recent changes in food buying habits can be attributed to the consumer's desire for convenience in the preparation of meals. This tendency toward convenience was accelerated by wartime demands on the time of the housewife. Frozen foods, custom baked goods, prepared mixes, soluble coffee, fruit and vegetable juices, prepackaged produce, baby foods and spiced meat are examples of trends which seem attributable to the desire for convenience.

The importance of watching these trends will be recognized. While many of them have been the result of wartime conditions, experience has shown that consumers seldom revert all the way to prewar habits. It is safe to assume that either all or some portion of the wartime change will become permanent.

What course of action should be followed in the postwar period?



Nielsen Instantaneous Audimeters are the latest type of radio survey devices that record the dialings in selected test homes, representing various income levels. Each home is equipped with a special signalling device, tied in with the radio and connected with the central recording installation by leased wire. This is the panel board of the pilot installation in New York. There is a similar set-up in the Chicago office.

Postwar Food Marketing Plan

A 6-point plan for success in postwar food marketing has been suggested by analysis of food industry marketing statistics and observation of the operating methods used by leading grocery manufacturers.

Point No. 1 is to employ certain precautions in launching new products and invading competitive fields. Many manufacturers are making plans of this nature. In fact, the trend has taken on the aspects of a

gold rush. And, as in every gold rush, some companies will reap worthwhile rewards while others will not. Failure means dissipation of assets, curtailment of earning power, jeopardizing trade position, and no permanent reemployment for labor released from war duties.

It has been suggested that we vaccinate ourselves "against the most insidious new-product disease —the greener pastures disease". From across the fence, conditions in the other fellow's industry may seem bountiful. Yet, records show a far higher percentage of failures than of successes where companies, established in one field, have invaded a non-related field. Even in closely related fields (e. g. all-purpose flour to special-purpose flour), the number of outstanding successful invasions has been quite small.

Reasons for this general inability of an established company to cross a fence successfully are as diverse as human judgment. But, in general, they boil down to failure to gauge competitive conditions exhaustively and accurately (via research) and failure to appraise properly the power of the originator's advantage. When a manufacturer pioneers in a particular field, he builds a position of leadership and a consumer and trade acceptance. To dislodge him from his position is usually a costly, difficult, long-term risk. Records suggest that, in general, it is better to pioneer a new product of improved or different characteristics than to imitate a successful competitor.

Hazards inherent in developing and marketing new products are being reduced substantially by using sound marketing research as a means of exploring the market prior to launching the new product. Among the more important types of data for this purpose are:

1. Size of market
2. Trend in size of market
3. Seasonal characteristics
4. Location of markets
   a. Territories
   b. City sizes
   c. Income classes
5. Most popular types of product
6. Most popular package sizes
7. Most popular price classes
8. Retailer gross profits
9. Importance of each distribution channel
   a. Chains vs. independents
   b. Store sizes
   c. Country general stores
10. Effective advertising and merchandising methods

After deciding to enter a new market, many reduce their risks by confining their marketing operations to test cities or to limited areas arranged for measurement by marketing research. In this way, the cost of any initial errors is greatly reduced.

In connection with this new product problem, we find that in most of the manufacturer's thinking and planning, he imagines himself in the role of the aggressor or invader. This is all right, but don't forget that, for every invader, there is at least one and usually several "invadees" or victims—and that, on the average, this defensive role will have to be played more often than will the role of the invader.

With this in mind, it would seem prudent to devote to defensive plan-

TABLE I—Wartime Changes in Food Production.
(on a tonnage basis)

Year	Production
1935–39	100
1941	113
1942	125
1943	132
1944	138
1945	136
1946*	134

* Production for 1946 based on preliminary estimate.

USDA data indicate that postwar food production was maintained at a level nearly equal to that of the war years.

TABLE II—Estimates of Retail Food Prices from 1940 to 1946 (using 1940 as an index of 100).

Year	Estimated retail food prices
1940	100
1941	109
1942	128
1943	143
1944	141
1945	144
1946 (1st 6 mos.)	151

The Bureau of Labor statistics on food retail prices indicate an upward trend. The rise is somewhat greater because the statistics do not reflect black market prices, subsidies and quality deterioration.

TABLE III—Changes in Food Retailing During the War.

Type of store	1946 vs. 1942 Increase, (percent)	1946 vs. 1945 Increase, (percent)
All stores	61	21
Corporate chains	57	31
Large independents (over $50,000 a year)	44	18
Medium independents ($10,000 to $50,000 a year)	65	16
Small independents (under $10,000 a year)	93	15

Substantial shifts occurred during the war in the relative sales volumes of retail grocery stores of various types. Small independents showed the greatest gains.

TABLE IV—Margarine Sales—Percentage Wartime Margarine Sales to the Combined Sales of Butter and Margarine.

Year	Sales, (percent)
1942	20
1943	26
1944	34
1945	41
1946	38

Relative margarine sales were doubled during the war.

TABLE V—Sales of Breakfast Foods

Year	Ready-to-eat cereals Index of consumer sales*	Hot wheat cereals Index of consumer sales**
1940	...	100
1941	...	100
1942	103	102
1943	119	116
1944	138	136
1945	132	142
1946	141	147

* Sales for year ending June 1.
** Sales for year ending Jan. 31.

Sales of ready-to-eat and hot wheat cereals showed substantial increases during the war.

TABLE VI—Grocery Stores Having Deep-Freeze Units.

Type of store	Oct.-Nov. 1944	Apr.-May 1946	Increase, (percent)
All stores	16.6	20.4	23
Corporate chains	29.4	36.0	23
Independents	14.9	18.4	23
Large independents (over $50,000 a year)	64.6	64.5	0
Medium independents ($10,000 to $50,000 a year)	19.1	23.8	25
Small independents (under $10,000 a year)	5.1	8.9	74

Demand for frozen foods is indicated by the number of stores which have deep-freeze units, and by the increase made in spite of the acute shortage of refrigerator equipment.

TABLE VII—Civilian Fruit and Vegetable Packs (in millions of cans—No. 2 cans or equivalent).

Year	Cases
1935–39 (average)	33.5
1940	50.6
1941	50.7
1942	47.1
1943	49.7
1944	52.7
1945	90.1
1946	103.8

Data compiled from the reports of the U. S Dept. of Commerce and the Pineapple Growers Association of Hawaii show spectacular sales gains

TABLE VIII—Consumer Sales of Infant Cereals and Canned Baby Food in Grocery and Country General Stores.

Period	Infant cereals*	Canned baby food*
Apr.-May '42	2,066	1,624
Apr.-May '46	4,009	6,027
Percent gain	95	272

* Thousands of cases.

Expanding sales of baby foods illustrate the trend toward convenience items for the housewife.

TABLE IX—Consumer Sales of 12-oz. Spiced Meat in Grocery and Country General Stores.

Year ending	Sales*
Nov. 30, 1940	61
Nov. 30, 1941	74
Nov. 30, 1942	70
Nov. 30, 1943	122
Nov. 30, 1944	165
Nov. 30, 1945	192
June 1, 1946	206

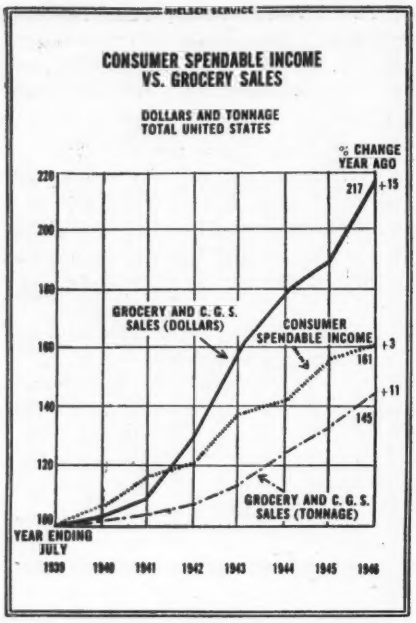
* Millions of cases.

Contrary to the dire predictions of cartoonists and humorists, the sales of 12-oz. spiced meat did not drop off when our fighting men returned from the war.

TABLE X—Wartime Sales Changes in Six Branded Foods.

Brand	Total consumer sales (percent) Prewar	Postwar	Change (percent)
"A"	16.3	27.5	+69
"B"	13.4	32.2	+140
"C"	6.6	31.7	+380
"D"	12.3	6.8	−39
"E"	42.1	23.9	−43
"F"	42.6	16.9	−60

Wartime changes in competitive brand positions have been striking. In no instance were the shifts attributable to wartime shortages, in the case f the products covered by the above analysis.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CONSUMER SPENDABLE INCOME
VS. GROCERY SALES
DOLLARS AND TONNAGE
TOTAL UNITED STATES
% CHANGE YEAR AGO
GROCERY AND C. G. S. SALES (DOLLARS)
CONSUMER SPENDABLE INCOME
GROCERY AND C. G. S. SALES (TONNAGE)
YEAR ENDING JULY
1939 1940 1941 1942 1943 1944 1945 1946

Fig. 1. Consumer spendable income rose three percent last year, and is now 61 percent over the 1939 level. Store sales (dollar basis) increased 15 percent last year, and on tonnage basis are estimated at 45 percent above the prewar level.

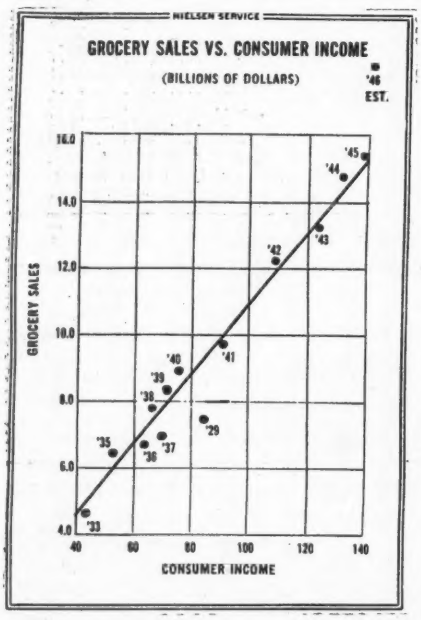


Fig. 2. Chart indicates that when consumer spendable income declines, the food manufacturer must suffer loss in sales.

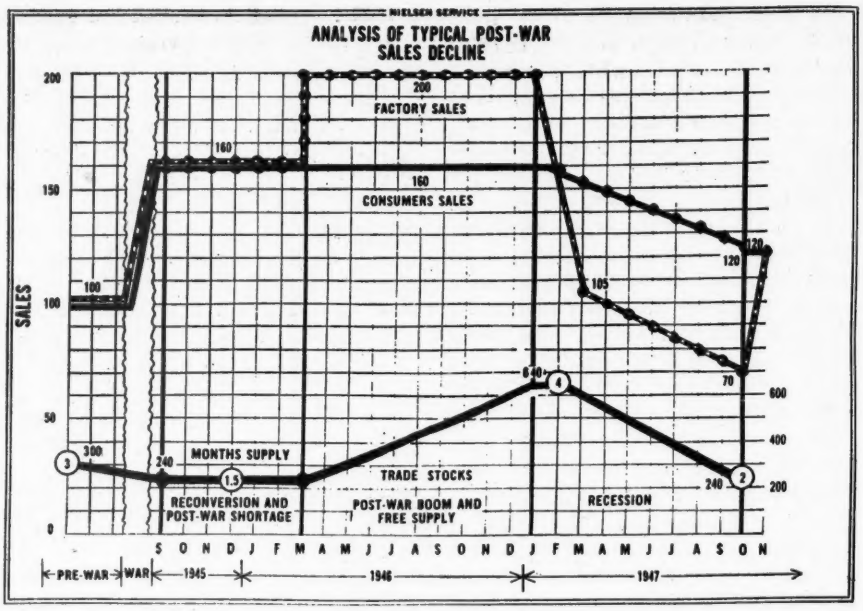
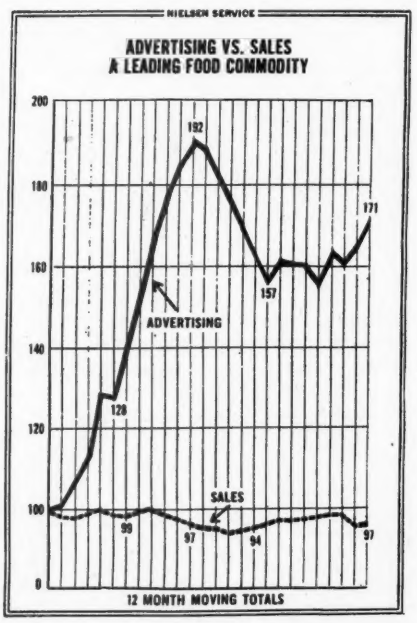


Fig. 3. This is the typical picture of the postwar boom and recession as seen by the Nielsen service. Factory sales will at first increase. Later a sharp recession is experienced. This is followed by a steady decline to more normal levels.



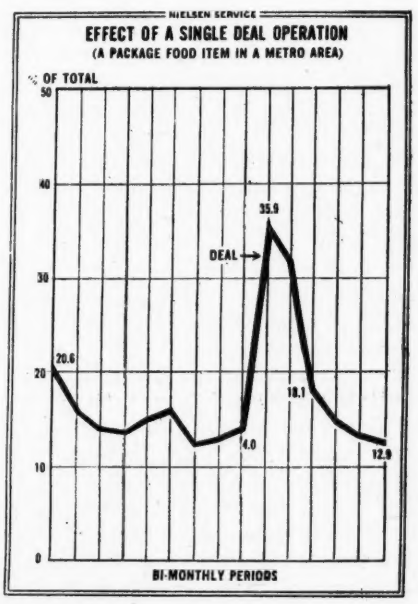


Fig. 4, Fig. 5. Faced with a sales decline, the aggressive manufacturer may increase his advertising campaign or make a single trade deal. He not only jeopardizes his profit position but also forces his competitors to follow his lead and ruin their profits.

ning at least as much effort as on offense. Here again, sound marketing research offers a great deal of help.

Point No. 2 is to reappraise competitive brand positions and promotional methods in the light of the postwar conditions. Wartime changes in competitive brand positions have been striking. For example, six important branded foods showed significant market gains or losses when their relative positions were analyzed (Table X). In no instance were the shifts attributable to wartime shortages.

While it is too early to measure the postwar changes in marketing methods, it is felt that they too will show some important shifts.

The manufacturer who plots his postwar course without some reliable means of re-appraising, at regular intervals, the continual shifts in commodities, brands and marketing methods is taking some unnecessary risks which ought to make his stockholders very nervous —and probably does.

Point No. 3 concerns the vital problem of dealing with the postwar recession or sales decline which is expected to hit us eventually. Those who don't subscribe to the theory that there will be a recession, would be prudent to be prepared for the possibility.

Consumers cannot spend more than they receive. When consumer spendable income declines, the average manufacturer must suffer a sales decline. Each individual manufacturer can hope that he will be an exception but, on the average, he won't be that fortunate. But if

a sales decline is inevitable, it does not follow that additional calamity will descend as a result of misinterpreting the nature, the timing and the degree of the slump—which can result in some very costly errors on the part of management.

A special set of statistics has been prepared by the A. C. Nielsen Co. to show the danger of such misinterpretation and how the resulting errors and losses can be avoided. Since these figures deal with the future they do not depict an actual case, but they do reveal a very typical situation of exactly the kind likely to occur in the near future. They are not exaggerated. The information is presented in Fig. 3.

When a recession begins, the manufacturer's first thought is: "Trade stocks have declined a bit, and consumer sales are off a little, too." But the long continuation of the decline soon forces him to conclude: "Competitors are cutting in. I'm losing my consumer franchise."

The aggressive manufacturer will take one or more steps to improve his competitive position, by: (1) Increased advertising, (2) trade deals, (3) one-cent sales, (4) consumer premiums, (5) price cutting.

If he is timid or not very well-heeled financially, or if he believes the depression will be very long and very deep, he runs for the storm cellar, slashing his promotional expenditures to the bone, discharging part of his sales force and also cutting his price.

Either of these courses may be very seriously wrong, as the additional facts revealed by marketing research will prove. Instead of basing conclusions on the trend of factory shipments, marketing research enables one to see what has actually happened to: (1) trade stocks and (2) consumer sales. During the postwar boom, trade stocks rose from 1.5 months' supply to 4 months' supply. Then, in the recession, they declined to 2 months' supply. Consumer sales, in contrast with the factory sales decline of 65 percent, have dropped only 25 percent, and are still 20 percent higher than the prewar level.

Similar curves for each of the competitor's brands (also available through marketing research) will enable one to know positively whether there has actually been any decline in one's competitive sales standing with the consumer. This apparently catastrophic decline in factory sales can occur without the slightest impairment of competitive sales standing.

The aggressive manufacturer who, lacking research facts, becomes alarmed by the sharp factory sales decline and engages in desperate and uneconomic forms of promotion not only impairs his own profits but he often forces competitors to follow his erroneous lead, whereupon they, too, find that their profit position has been ruined. It is a vicious and very costly circle.

The timid, conservative or pessimistic manufacturer pursues the opposite policy and cuts the heart out of his promotional efforts and prices. This fellow ruins his own consumer franchise. Even more important, he and others who pursue the same policy actually create or accelerate a general economic depression for the entire country.

As a rule, neither of these extreme courses is justified—and when management is armed with the actual facts, based on sound research, the correct and most profitable course of action can be devised and executed—for the good of the individual company as well as the food industry and the whole country.

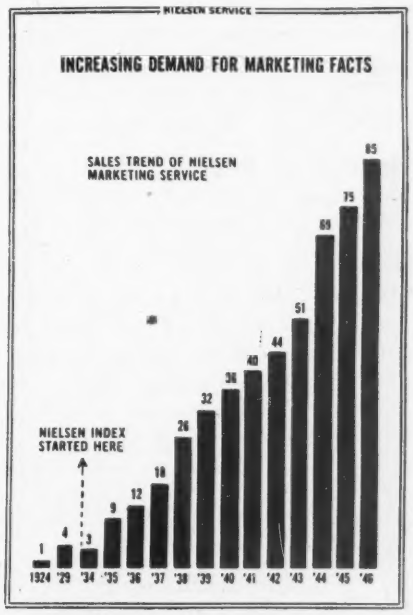
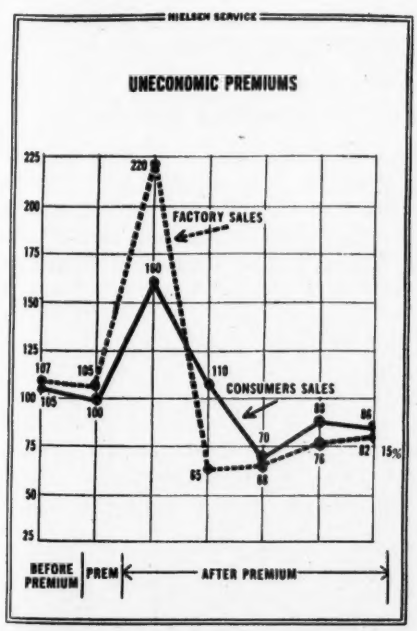

NIELSEN SERVICE
INCREASING DEMAND FOR MARKETING FACTS
SALES TREND OF NIELSEN MARKETING SERVICE
NIELSEN INDEX STARTED HERE
1 4 3 9 12 18 26 32 36 40 44 51 69 75 85
1924 '29 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46

Fig. 8. Demand for marketing research has increased rapidly. In 1946 the sales trend of Nielsen Marketing Service reached a level 85 times higher than that established in the base year of 1924.



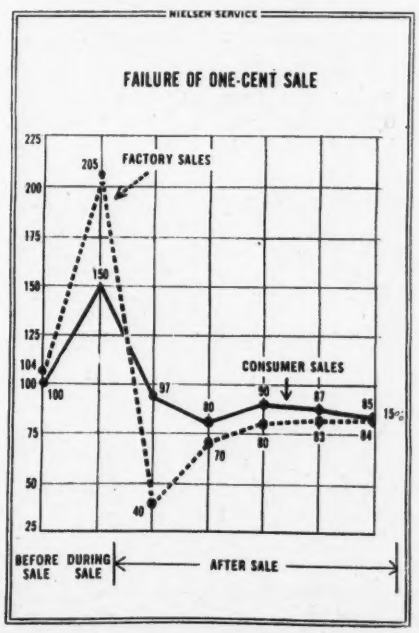


Fig. 6, Fig. 7. The aggressive manufacturer may be alarmed by sharp factory sales decline. He engages in desperate and uneconomic forms of promotion, such as one-cent sales and consumer premiums. But, instead of basing conclusions on the trend of factory shipments, he can be armed with the facts on trade stocks and consumer sales so that he can decide and follow the correct and most profitable course.

Point No. 4 is to know more about marketing research and to learn to apply it effectively to important problems to insure success in postwar marketing.

Few executives appreciate fully the amount of progress made recently by marketing research. In a very few years, it has become one of management's most vital executive tools. To cite a few facts:

1. A. C. Nielsen Company's 12-year growth has been rapid and uninterrupted. All records were broken in 1946, with the volume of marketing research at a level 85 times that established in the base year of 1924 (See Fig. 8).

2. The average annual expenditure per client has risen, since 1929, from

(*Continued on page* 192)

Processing Food For Sterilization

PART I—This discussion of principles of heat sterilization explains much and proposes a possible explanation of "broken" heating curves where the rate of temperature increase within a container changes abruptly

By C. Olin Ball,* Director, Process and Product Research
Owens-Illinois Glass Company, Toledo, Ohio

IN commercial canning, when a food is put into a container, it always contains micro-organisms that would cause spoilage of the food if they were not subsequently destroyed. Some organisms will not cause spoilage when subjected only to ordinary conditions; and such organisms, it sometimes may not be considered necessary to destroy. When all spores of a certain organism in a container of food have been destroyed, the food is said to be sterile with respect to that organism. The object in heat processing canned foods is the attainment of sterility with respect to the most resistant micro-organism present that would bring about spoilage.

Requirements of A Satisfactory Process

In determining the merits of a process, one must examine it from the standpoint of four factors: (1) Economy; (2) Quality of product; (3) Uniformity of product; (4) Sterilization of product.

It may at first appear in this discussion that we should be interested only in factor (4). In studying processing we quickly learn, however, that the four factors are inseparable. If the problem of processing involved only the sterilization of foods, it would be an extremely simple problem, solved by choosing for every process a temperature and a time that would leave no doubt as to the destruction of all micro-organisms. Along with the possibility of disregarding quality and uniformity, we should have the possibility of disregarding refinements of retort operation. We should not need to study venting; and variations in temperature within a retort would be of little practical importance.

There may be a legitimate question as to how much the factor of economy has influenced the development of processing methods in the past, but there is no question but that now the bringing into use of certain new technics is being influenced greatly by considerations of economy. Promised benefits in quality and uniformity of product are balanced against estimated cost with great deliberation. Observing this, one should say that economy is at least on a par in importance with quality and uniformity of product.

The objective sought in all processing is to ensure sterilization of the food with the least possible impairment of the quality. To obtain this objective, much attention must be given to the combination of time and temperature chosen. A number of general principles have been learned that are helpful in this connection. For instance, it has been found, with products having the higher rates of heat penetration, that better quality can generally be obtained by processing at a high temperature than can be obtained by giving an equivalent process at a lower temperature. The shortest possible "coming-up" time also has been found to be advantageous. The latter applies to most products, but is of less importance with those having the lower rates of heat penetration.

Ideal Conditions

From the standpoint of retort operation and control, the ideal conditions are absolute uniformity of temperature throughout the retort at every instant, coupled with absolute control of the time-temperature relation. Probably these conditions are not attained commercially at the present time. A question that must be answered, then, in deciding for or against the use of any method of processing, is "How great a deviation from these conditions can be tolerated?" Facts having a bearing on the answer to this question will be discussed presently.

One of the first requisites of a good process is that, at least throughout the holding period of the process, the operator shall have accurate knowledge of the temperature in every part of the retort. Thus, another question to be answered in reference to the method is "Has this been demonstrated to be possible or, if not, do the results of experiments indicate that it will be possible?" We shall not attempt to provide answers to these questions since the answers must depend upon varying factors in specific cases that will not be discussed here. However, we hope that the following pages will assist the reader in answering them for himself.

Historical Review

The studied use of heat in sterilization of food started with Nicholas Appert. He used boiling water for his early processes. Later the use of the salt bath, and then the autoclave, brought major advances in the technic of food sterilization by making possible the employment of temperatures higher than 212 deg. F. The salt solution bath, however, was completely discarded when improvements in the design of and in the technic for using equipment for steam pressure processing began the cycle of developments that has brought the industry to its present state of progress in the use of retorts of both the batch and the continuous type.

Heat processing under pressure is still the most satisfactory method of sterilizing canned foods of low acidity although for many

* Presented at the 1946 Food Processors Conference, University of California.

years past, and continuing today, investigations have been widespread of the efficacy of other agents in sterilizing food. Most of these agents are concerned with either high-frequency waves or modern principles of chemistry.

Scientific methods of heat process evaluation that have come into practical use during the past two decades are of great assistance in studying the relative effects of equivalent processes at different temperatures upon quality of a product. From the data of heat-process evaluation we have gained important knowledge. High temperatures have less adverse effect on flavor, texture, and appearance of foods than lower temperatures assuming, of course, that each temperature is applied long enough to produce sterility.

For a number of years, a processing technic, known as fractional sterilization, was practiced by some canners as a means of preserving quality in their low-acid products. Three or more treatments at or below the temperature of boiling water, on successive days, were used. The process was based on the assumption that, between heating periods, spores not destroyed by previous heating would develop into the vegetable forms that would be destroyed during the next heating period.

Today, nobody would think of using fractional sterilization for low-acid foods. The method is unreliable because micro-organic spores frequently lie dormant (that is, do not develop into the vegetative form that has low heat resistance) for considerable periods of time. The length of the period of dormancy cannot be controlled, nor can it even be known with certainty.

Scientific Retort Manipulation

For the highest quality in retort-processed foods, retorts must be operated so that: (1) all containers are heated to the same extent; (2) the holding temperature is attained rapidly in the retort; and (3) the containers are cooled rapidly.

Ball (1938) listed the four steps that stand out in the history of processing, contributing to advancement of the technic of "still" retort operation, as follows:

1. The introduction of the indicating pressure gage and the indicating thermometer as retort equipment.
2. The change from generation of steam within the retort, by external heating of the retort, to the piping of externally generated steam into the retort.
3. The studies of heat penetration into the container and of temperature distribution within the retort, especially the studies made with thermocouples.
4. The introduction of automatic temperature and pressure controllers.

Proper temperature distribution within the retort (Item 3, above) is attained through carefully planned distribution of steam supply within the retort, coupled with adequate venting to remove the air (Ball, 1924). Specific recommendations on methods of steam distribution and venting have been published by National Canners Association (Anon., 1943) and Somers, 1944.

Several other factors pertaining to retort design and control deserve discussion in their relationship to the production of quality in canned foods, but the space available here does not permit such extended discussion.

Heating Food in Containers

A study of methods which might be used for heating food in containers for the purpose of sterilization should include all of the methods listed below:

I. Heat applied to only one face of container.

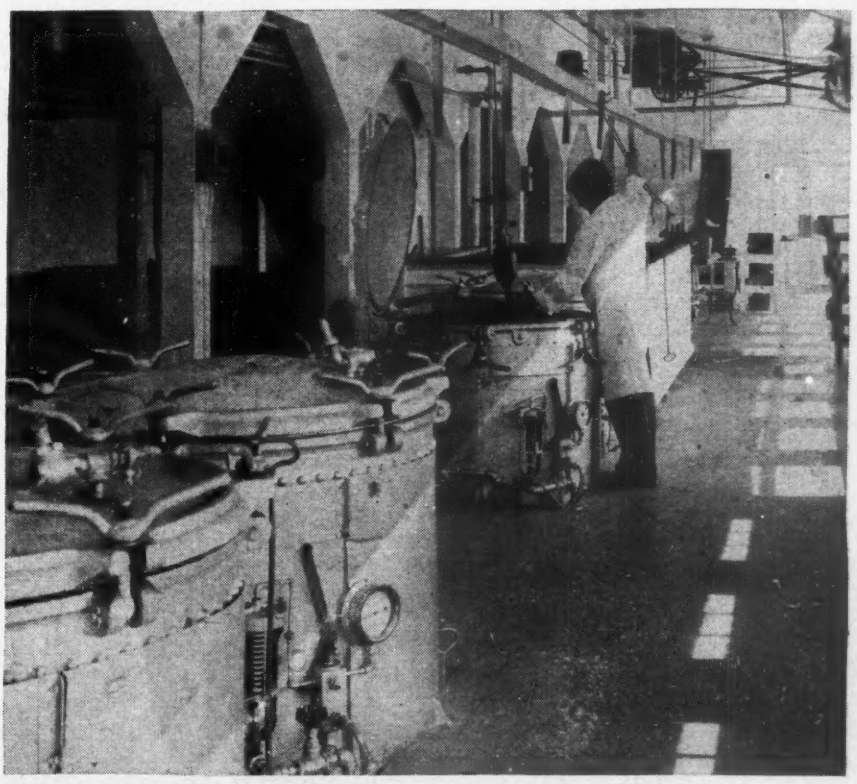
II. Heat applied to multiple faces of container.

- A. Container enveloped in heated air.
- B. Container enveloped in mixture of air and steam.
- C. Container enveloped in pure saturated steam.
- D. Container enveloped in heated water.

III. Container subjected to influence of high frequency electrical waves.

Method I is exemplified by a container resting on a heated surface, such as the top of a stove, or over a gas burner, with the container enveloped in an atmosphere which is heated only incidentally. It is not a good method because it is slow, hard to control, hard on the container, and hazardous. The method has never received serious consideration in connection with canning technics.

Method IIA is exemplified by a container within a gas heated oven, such as a baking oven of a kitchen gas range. This method has been used in home canning, but it does



Object sought in all processing is to ensure sterilization of the food with the least possible impairment of quality. The shortest possible "coming-up" time is advantageous, unless the products have a low rate of heat penetration. Economy is important also.

not have acceptance as a good method because it is both slow and dangerous.

Steam and Air Processing

Method IIB has been used commercially in processing glass containers in retorts, but during the past 15 years the method has lost favor completely because of its uncontrollability in retorts of commercial size. Much information on attempts to perfect this method of processing is in existence but space does not permit its inclusion here.

Theory of Heating with Steam And Air, Practical Considerations

Even though the premeditated use of a mixture of steam and air in heating containers of food for sterilization is rejected both in principle and in fact, the functioning of a mixture of steam and air as a heating medium still merits thorough study in connection with this subject because, even in pure steam processing in still retorts, the effect of steam-air mixtures must be taken into account. Regions, commonly called "air pockets," containing mixtures of steam and air, always exist in a retort for some time after steam is first turned into the retort. They exist until all air has been expelled from the retort by venting. It is for this reason that uniformity in treatment of the container is promoted by bringing up the temperature of the retort, with complete expulsion of the air, in the shortest possible time.

In some so-called pure steam processes, air is trapped in certain regions within the retort because steam inlets and vents are not properly located to produce movement of steam into all parts of the retort and because circulation of steam is seriously retarded by containers, trays, etc. Such a condition produces a variation in temperature within the retort during the first portion of the holding period, and an operator will not be aware of the presence of the variation if it so happens that the thermometer is located in a region of pure steam. With improper steam admission and venting, such variations have been known to persist for 20 minutes while no indication of their presence was given by thermometer and pressure gage. It is to assist in safe-guarding against this condition that venting throughout the duration of steam processes is recommended.

Instead of exploring the mechanics of removing the air from the retort, it is desirable to emphasize the importance of air removal by dwelling at some length upon the theoretical side of the effect of "air pockets" upon the process.

Equilibrium Conditions

According to the laws of the diffusion of gases and vapors, when two gases are brought into contact with one another, they mix until each is uniformly distributed (except for the effect of weight of gas and vapor) throughout the enclosure to which they have access. A mixture of steam and air exerts a pressure that is the sum of the pressure exerted by the steam and pressure exerted by the air. How closely the separate components (steam and air) agree with Boyle's law need not concern us greatly so long as we bear in mind Dalton's principle. The latter means that, if the steam in our mixture of steam and air is saturated, it must have the temperature which, for saturated steam, corresponds to the partial pressure of the steam in the mixture.

Even under most favorable conditions the diffusion of gases and vapors requires an appreciable length of time. The rate of diffusion may be reduced by numerous factors, some of which have special importance for the behavior of air and steam in a retort.

One of these factors is restriction of the size of the opening through which two vapors are in direct communication with one another. The opening may be so small that a very long period of time will be required for complete mixing of the vapors to be effected. Containers, trays, etc. in a retort impose such interference to diffusion.

The second factor is the possibility of the existence of many different conditions within a mixture of steam and air; all of these conditions having an influence upon the rate of attainment of equilibrium conditions within the mixture.

In a mixture of steam and air, the equilibrium condition which the mixture seeks to attain is that in which the steam is saturated at the temperature of the mixture. In this equilibrium condition, the difference in pressure between that of the mixture and that of saturated steam at the given temperature is supplied by the air. The conditions that actually exist in the mixture, however, bear a definite relation to the original temperatures, pressures, and volumes of the components.

If an unlimited quantity of saturated steam at the temperature desired for a mixture were to enter a given quantity of air having a temperature lower than, equal to, or just slightly above that temperature, an equilibrium condition would ultimately be attained, provided radiation heat loss were low. But, of course, the amount of enclosed air would need to be less than enough to fill the space at the final pressure after the air had assumed the final temperature. The ratio between the quantities of the two components in a tight vessel could be controlled by establishing the pressure of the mixture. This pressure is, however, critical for the quantity of air present and the temperature chosen for the mixture. If the pressure were controlled by venting through a pressure relief valve, some air would escape, thereby producing a different ratio of steam and air in the mixture.

If the combination of the original conditions of the air and the steam is not such as to result in the establishment of the equilibrium condition of the mixture, a mixture may result in which the air supplies more pressure than would be its proper share in a mixture under the above defined equilibrium condition. In that case the steam will be in a superheated state.

Such a condition could occur if the initial temperature of the air is higher than the saturation temperature of the steam corresponding to the partial pressure of the steam after the mixture is formed. During the formation process, the steam may either increase in temperature without expanding or expand without decreasing in temperature, to become superheated. On the other hand, it may be that, in certain regions within the mixture, the air will supply less than its proper share of pressure. The steam then must make up the deficiency. In doing this, the steam must maintain a temperature higher than that desired in the mixture. The steam may or may not be saturated. This possibility of the existence of many different conditions is the *second important factor* having an influence upon the rate of attainment of a uniform mixture of air and steam.

The *third factor* that should be

(*Turn to page* 192)

— JUICELLS —

New Form of Canned Grapefruit*

This process, designed to mechanize the separation of grapefruit sections, has created a new product. Its novelty lies in splitting the fruit, everting and decelling against a wheel carrying wire loops that scrape off the pulp

JUICELLS is the name tentatively given to a citrus product recently developed by Bruce's Juices, Inc., Tampa, Fla. Juicells are made by a patented process which mechanizes the preparation and processing of this form of canned grapefruit.

The product is a heavy suspension of the cells of citrus fruit in sweetened juice of the fruit from which the cells have been taken. It may be used as a breakfast dish, as a base for fruit cocktail and is particularly adaptable to gelatine salads and desserts.

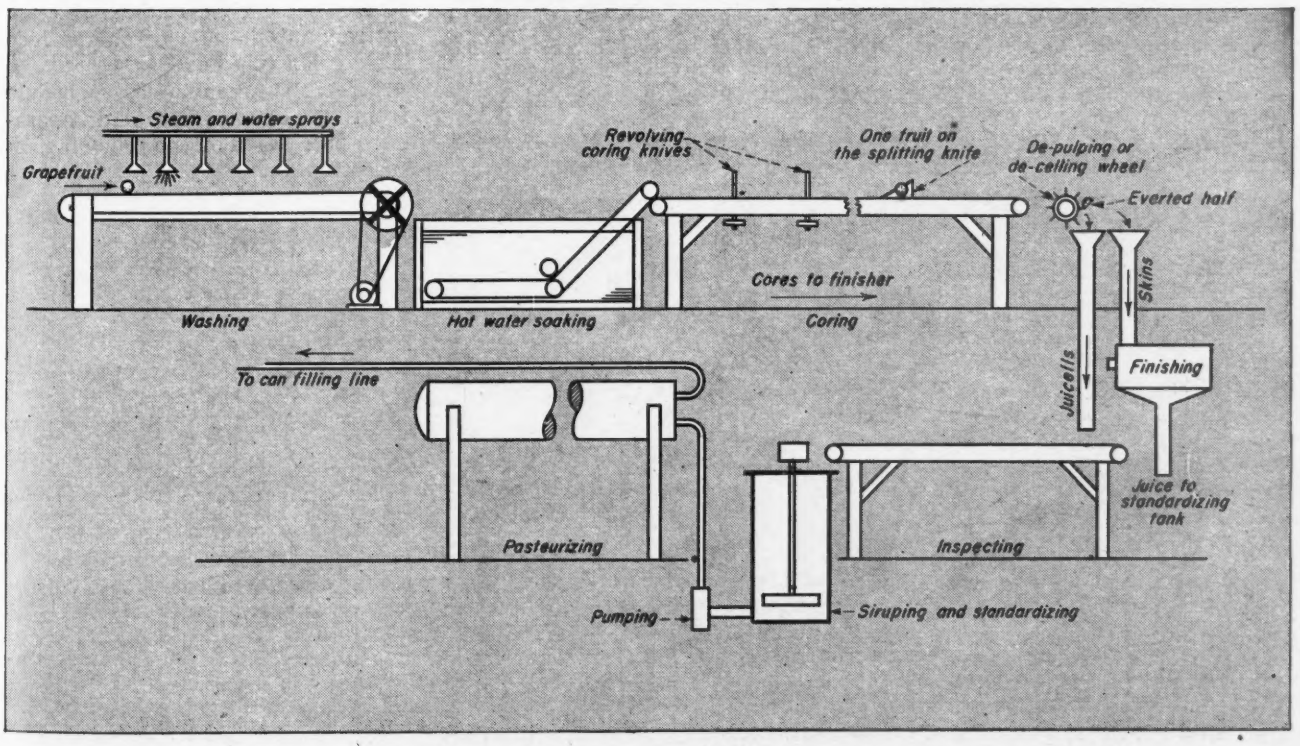
Machinery has been designed, a pilot plant constructed and production has been started. The product has proved to be extremely stable in shipping tests.

The Process

Unlike the standard fruit segment process, the fruit in this case does not have to be graded for size and variety. Grapefruit is conveyed from the bins and passed under a series of jets of steam and water. From here the fruit is conveyed through a hot water tank, the temperature of the water being close to the boiling point. Next stop is at the coring machine which consists of a steel tube in the vertical position. The edge of the tube is sharpened and, as it rotates at a moderate speed, the fruit is pressed down by hand and completely cored. The core drops through the tube, then into the juice finisher which salvages the juice and rejects the seed, rag and peel. The operator cuts the fruit in half around the equator and turns the halves inside out. With a few shakes the seeds are discarded and the everted (inside out) fruit collar moves on to the de-pulper.

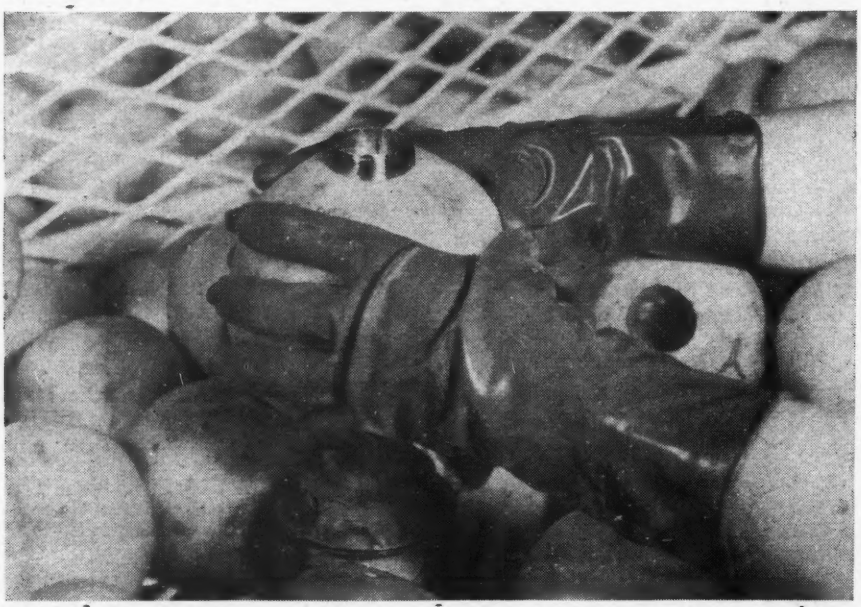
The de-pulping machine is a metal wheel 7 in. in diameter and approximately 1¼ in. wide at the periphery. There are a number of wire loops about 1 in. in diameter around the face of the wheel and parallel to its axis. Materials used in construction of the de-pulper should be of a type that will keep electrolytic action of the metals at a minimum. Aluminum wheels with stainless steel loops have been found to be satisfactory. The wheel re-

*Based on information received from Bruce's Juices, Inc.



Flow diagram for production of Juicells from grapefruit.

The grapefruit pass under steam and water sprays, then through a hot water tank. The coring operation (above) is next. There is no need to grade for size.



The coring machine has a vertical steel tube with a sharpened edge. The fruit is pressed down by hand on the tubular knife, which rotates at moderate speed.

Fruit is cut in half. Halves are then everted (turned inside out). Everted fruit collars move on conveyor above the table to the decelling or depulping station.

to be satisfactory. The wheel revolves about a horizontal axis at a peripheral speed of approximately 250 ft. per minute. The everted grapefruit collars are pressed against the wire loops so that the pulp is scraped from the peel in a direction perpendicular to the periphery of the fruit collars. It was found that a burr, as commonly used in juicing citrus fruit was not satisfactory since it folded over the segments of fruit and protected the cells from being removed.

The pulp, as it is removed, falls into a stainless steel funnel, flows by gravity over a magnet into a stainless steel screw conveyor. Juice and pulp are mixed and conveyed on a screen as the latter comes from the de-pulper. The standard screen is of stainless steel with $\frac{1}{8}$ in. openings. Inspectors remove whatever seeds and pieces of rag have come through. Sugar is then added to the juice, in predetermined amounts. The two are then combined again in a mixing tank equipped with a rotary stirrer.

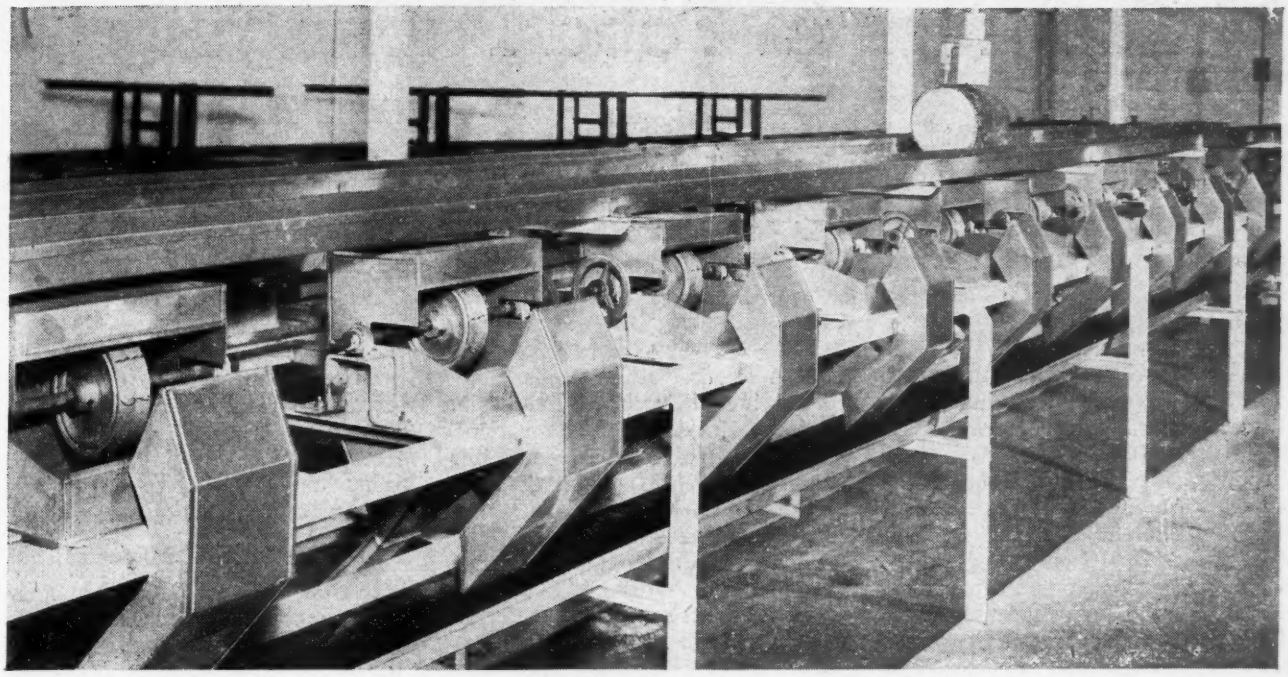
The product is pumped from the tank through a pasteurizer, thence to a converted M & S can filler. Cans then are closed, cooled, and warehoused in the conventional manner.

Production Cost

Although machinery used in the Bruce pilot plant is only semi-automatic, the production cost of these juice cells is small in comparison with production cost of segments. Machinery designed to do the job entirely automatically would reduce labor costs still further.

Below is given a cost schedule from the Bruce pilot plant operation. It is based on the following assumptions:

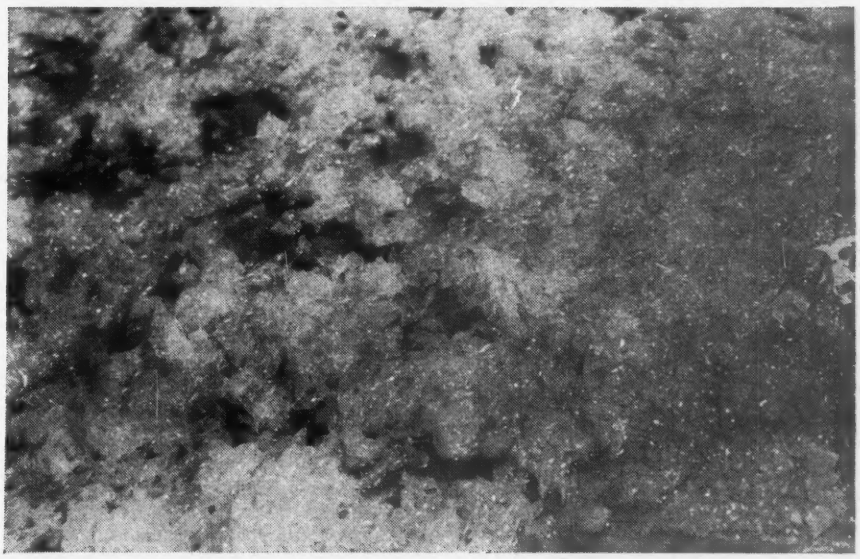
Labor @ $0.60 per hour
Sugar $6.215 per 100 lb.
No. 2 cans $18.62 per thousand
Grapefruit Juice 10 deg. Brix
Juicells 18 deg. Brix
Grapefruit $2.70 per box
Prime Operations:
Yield: 80 percent = 2.16 gallons or 276 oz. per box of fruit
Production: 11.16 gal. per man-hr. = 8.928 gal. per man-hour at 80 percent usable material
Cost (other than fruit cost) per dozen No. 2 cans:
Coring 0.0297
Cutting 0.027
Turning 0.0352 (everting)
Decelling 0.0626
Inspecting 0.030
Weighing and adding sugar 0.01
12 cans 0.2234
Sugar 0.0779
Cost of 12 cans $0.4958
(Shipping container cost omitted.)

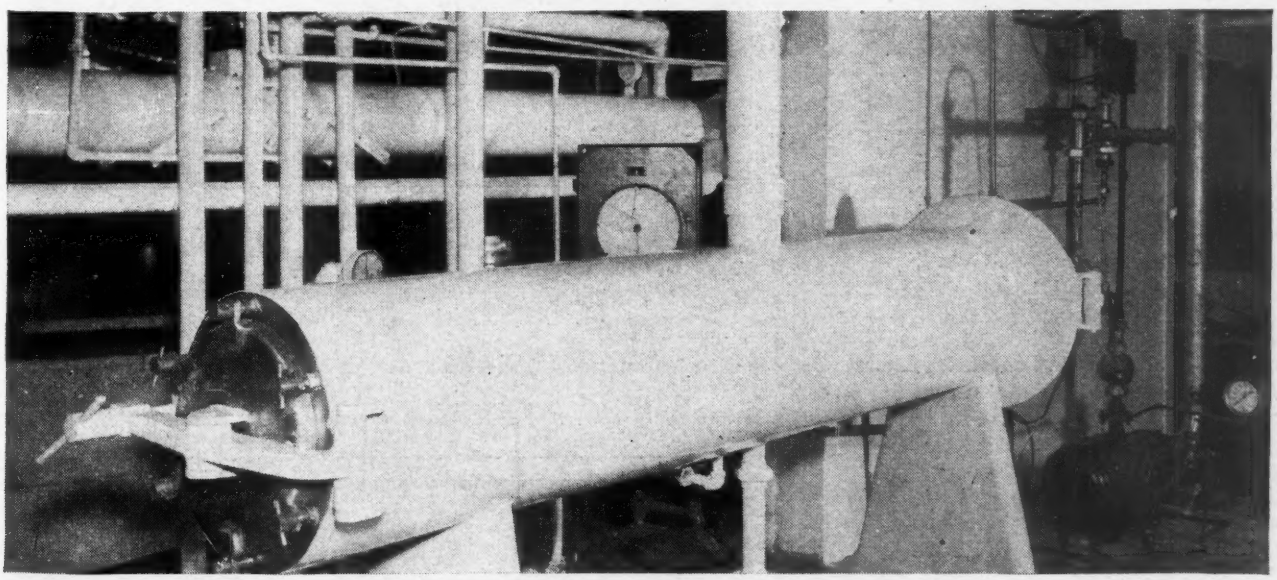


(Above) Everted grapefruit halves are pressed against the wire loops of these depulping wheels which travel at a peripheral speed of 250 ft. per min., scraping the cells off the peel.

(Right) Cells are retained on a stainless steel screen with ⅛ in. holes, while juice drains away. Cells pass along inspection table where any seeds and rag pieces are removed. Picture shows separated cells on top of table.

(Below) Mixture of cells and juice is pumped through flash pasteurizer for sterilization. Product then flows to can filler. Cans are closed and cooled, then warehoused in the usual way.





Progress in Food Packaging

More prepackaged produce and faster frozen food packaging were foreshadowed at the Packaging Institute meeting. Prepackaging has gained public acceptance, according to a poll report. Frozen food lines may operate at 200 per minute

DURING the eighth annual meeting of the Packaging Institute at Chicago important papers were presented on packaging fresh produce, fresh meats, and frozen foods. Among subjects covered were: Merchandising and Packaging Fresh Fruits and Vegetables, Public Opinion on Prepackaged Fresh Fruits and Vegetables, and High Speed Packaging of Fresh and Frozen Foods. Other subjects discussed included: Food Processing Outlook, Packaging Frozen Foods of the Future, What Modern Merchandising Will Demand of Packaging, and Packaging for Air Cargo Shipment. Three industry seminars were held on Candy and Confectionery, Crackers and Baked Goods, and Beverages. Three of the addresses are given in digest form.

Opinions on Packaged Produce

S. K. Bradley

Union Bag and Paper Co.

GENERAL opinion at present on prepackaged produce is that the public and the retailer gain in time saved—shopping time for the public and clerk time for the retailer. This was pointed out by S. K. Bradley, Union Bag and Paper Co. Whether the savings in time offset packaging costs is still controversial, but indications are strong that they do. There are claims and counter claims by the various suppliers of packaging equipment and packaging materials. The Union Bag and Paper Co. employed Fact Finders Associates to survey, through personal interviews, the consumer and retail store managers in all parts of the country so that a valid conclusion on public opinion might be reached. The survey covered 150 opinions in each of 12 areas and 200 opinions in each of 16 areas, or a total of 3,200 opinions on various questions.

Questions were asked of managers and customers in chain and independent self-service markets in all parts of the country—in large cities, in medium size cities, and in groups of smaller communities. National population concentrations were covered proportionally but care was taken to include those areas where produce prepackaging experiments have been undertaken. Managers of 456 chain store self-service markets and 334 independents were questioned.

These reactions have added significance when we examine the answers of the 75 percent who have had experience in selling prepackaged produce in their stores. More in the 75 percent group answered favorably on efficiency, store traffic, cut in produce waste, increase in sales and lower cost.

Managers were asked whether visibility was essential, preferred, or not important in relation to seven typical produce items. For potatoes, their opinion was that visibility was: essential, 55 percent; preferred, 23 percent; not important, 22 percent. Spinach, string beans, carrots, lettuce, cooking apples, and oranges received a vote of 89 percent in favor of visibility.

Self-Service Markets

In 790 self-service markets, the manager and three customers were questioned. Customers and managers were asked different questions. The number of housewives interviewed was 2,367. Significantly, the areas where prepackaging has been undertaken ran higher in favor of prepackaging. For example, Columbus, Ohio, housewives voted yes, 74 percent; no, 20 percent; indifferent, 6 percent. In Newark, N. J. they voted yes, 78 percent; no, 22 percent; indifferent, 0. Conversely, there were more stores in the San Francisco area where managers had no experience in selling prepackaged produce than in any other of the 16 areas. On this question in San Francisco, the housewives voted that they preferred prepackaging, 49 percent; that they did not, 44 percent; and indifferent, 7 percent.

As a lead to the general type of packaging which might be preferred, they were asked if they wanted to use the package at home to keep the unused portion of the commodity. Answers varied for the different items, from one-third to one-half saying "yes," they wanted this advantage in a package.

TABLE I—Opinions of Store Managers on Prepackaged Produce.

Question	Yes (percent)	No (percent)	Don't know (percent)
If you sell prepackaged, prepriced and preweighed produce of guaranteed quality, would store efficiency be increased?	85	7	8
Would prepackaging cost too much?	23	50	27
Would it speed up store traffic?	89	6	5
Would it cut produce waste?	68	21	11
Would it increase produce sales?	51	22	27
At the same price as unpackaged, could you sell as much?	48*	12	5
At $0.01 more per package than for a similar quantity unpackaged, would you sell more?	33**	23	5

* 35 percent said they would sell the same amount.
** 39 percent said they would sell the same amount.

TABLE II—Opinions of Consumers on Prepackaged Produce.

Question	Yes (percent)	No (percent)	Indifferent (percent)
Would you prefer to buy produce prepackaged and prepriced?	64	21	15
Would you pay $0.01 more for prepackaged produce?	72	28	....

Prepackaging of Produce

Nelson Allen
Cellophane Division, E. I. Du Pont de Nemours, Inc.

RAPID turnover and the control of temperature are the principal methods used to bring prepackaged fruits and vegetables to the consumer in top quality, according to the paper of N. Allen, E. I. Du Pont de Nemours, Inc. The greater the period of time that elapses between packaging and sale or use of the produce, the greater are the problems. Fresh fruits and vegetables continue to live after harvesting. Water, carbon dioxide, and other products are given off, and oxygen is absorbed. Respiration rate varies with the product. Preservation of produce is a matter of controlling respiration rate.

Location of Operations

Prepackaging may be done at the source by the grower-shipper; by a repacker or wholesaler; in a central warehouse for distribution to the stores of a chain; or in the retail store.

Problems are least involved in the retail store where produce are packaged prior to sale. Much handling is eliminated and preservation of produce is not complicated by prolonged holding.

Central warehouse packaging and distribution to units of a chain permits economies in handling and the application of machines that would not be justified in the smaller operations of the retail store. Since packaging is further removed from the point of sale, greater care must be exercised in maintaining the quality of produce.

The repacker or wholesaler is in about the same position as the warehouse packer, but his time interval between packaging and consumption may be even longer. His operation must be set up for rapid turnover, or he must reduce the respiration rate of the produce by refrigeration.

Being farthest removed from the consumer, the grower-shipper must do the best job of keeping his products in prime condition. Sale of prepackaged produce has not reached the point where a large grower-shipper can find outlets for his entire crop in a packaged form. Complete packaging of a large crop requires more labor and materials than is needed for bulk packaging. For example, an 8-man crew is required to prepackage 10 tons of tomatoes in one day.

The produce package must have visibility, durability, be easy to handle and display and must have eye appeal. It must be designed to arouse the desire to purchase. Although the package may make the first sale, subsequent sales will depend on the product itself. Fundamental requirements for prepackaged produce consist of: (1) A quality product; (2) a package with visibility, durability and salability; and (3) maintaining the produce in a wholesome condition.

Moistureproof wrappers prevent wilting and loss of moisture from produce. Salable life of packaged produce is extended one to two days over bulk (unpackaged) produce when not refrigerated, and three to four days when refrigerated.

In commercial packaging, an air-tight package is not attempted. Bags have small openings around the sealed edges and machine overwrapped trays or boards are never air-tight. These openings are sufficient to permit enough oxygen to enter the package and prevent anaerobic respiration. Packages of highly perishable items, such as peaches and asparagus, may be purposely ventilated by punching out a small hole in the wrap. This ventilation is adequate to supply the oxygen needed and yet does not permit loss of any more moisture than is lost from an unventilated package. Transparent films of higher permeability to water-vapor are desirable for tomatoes, spinach and salad mixes, since molds and slimes develop rapidly at high humidities.

A problem with visible packages is the prevention of condensation of liquid water as small droplets (fogging). This is not objectionable if not too extensive, but if the contents of the package are obscured, then the purpose of the visible package is defeated. Fogging is caused by variations in temperature in different areas of the package and distillation of water-vapor from the region of high temperature and condensation in the region of lower temperature. If a uniform temperature is maintained, fogging is prevented. A film of higher water-vapor permeability reduces fogging but does so at the expense of rapidly wilting the product.

In addition to transparent films, other wrapping materials are needed, such as papers, boards, trays, cartons, labels and shipping cartons. Board stock and paper stock must not impart any odor or flavor to the produce. For moist items, the papers and boards must be resistant enough to water to maintain stiffness throughout the life of the package. For economy in operation, costs must be kept to a minimum and boards and trays must be capable of being set up rapidly with little labor.

Shopper's view of prepackaged produce in a retail store. Transparent bags and cartons with windows made from transparent films provide visibility. Prepackaged items can be neatly arranged. Refrigeration and prepackaging extend the merchantable life of fruits and vegetables and increase sales.

Faster Frozen Food Packaging

F. W. Lanigan

Dewey and Almy Chemical Co.

VISUALIZE a frozen food plant where the product is harvested from the field, vined, trucked to the plant, cleaned, graded, blanched, processed and packaged at 200 packages per minute. F. W. Lanigan, Dewey and Almy Chemical Co., stated that such a plant is not impossible. Canners who are processing frozen foods have had experience with such speeds. If it can be done with a can, why not with other packages? True, frozen foods cannot be handled exactly as canned foods, but how great are the differences? Suppose a frozen food packer packs his product prior to freezing. Here he is approaching the canning operation. How far apart are such operations if the packer uses one of the composite cans now available? The only difference is that he freezes rather than heat sterilizes and his costs with this straightline operation are close to rock bottom. Not all frozen products can be handled similarly to a regular can production line, but high volume items can be.

A new foil package lends itself to high speed packaging. This is a rectangular package that can be formed, filled, and sealed on a packaging line at the rate of 125 packages per minute. The operation is automatic. The problems of feeding foil of substantial thickness from a roll, forming, filling, and sealing the resultant package, would have seemed insurmountable a few years ago. Now it seems easy. We can look forward to other developments soon based on the high speed, automatic packaging of frozen foods in packages that offer adequate protection to the product.

In other fields cartons are being handled at speeds in excess of 200 per minute. If single production lines can be run at these speeds with equipment designed for the product and for the package which in turn is built around the product, then frozen foods can at least approach these speeds.

The folding carton has so many basic advantages as a frozen food package that it seems ridiculous not to run it at higher speeds. Other types of packaging materials have more inherent moisture-vapor resistance than folding cartons, but this defect of cartons can be remedied by making the carton stock more protective. Use of thermoplastic adhesives should result in a package for high speed production. Experimental work is being done to perfect a method whereby the adhesive is applied in the carton manufacturers' plant and is reactivated by means of heat in the packers' plant to give faster and more positive seals.

Recently there have been a few steps taken toward high speed operation of frozen food lines. The Food Machinery Co.-Marathon Corp. development shows what can be done if packages and equipment are built around the product instead of trying to make the product conform to existing equipment. In this case, joint efforts of a package supplier and a machinery manufacturer resulted in a new approach to frozen food packaging. Two can companies have just introduced a composite lap seamed fiber can, designed to run at high speeds.

Labor Saving

Until now, carton companies have had pretty much of a monopoly in the packaging of frozen foods, but labor costs have been high. Other packaging materials are appearing where the producers have capitalized on the principles of high speed automatic packaging. Even if the actual package material cost is higher than some of the containers using slower methods of packaging, the higher price of a container can be effectively balanced by obtaining lower overall costs where economy of greater speeds can more than compensate for lower initial costs and higher handling costs. As in the case of the canning and cereal industries, economics will eventually force the cost level down. By cutting the cost of packaging, one of the major portions of the total cost will be reduced.

More different types of packages are used for frozen food than for any other processed food. Packaging has been a question of what material was available at the moment; what equipment could be installed the quickest; and what supplier had the lowest price. The canning industry at one time had a similar situation. Every time a customer ordered a can, a new size was born. Finally, the canning industry—both canners and can manufacturers—got together and reduced the number of sizes of cans to a few standard sizes. Many feel that the need for high speed packaging of frozen foods will force a similar simplification of packages without sacrificing quality.

Straightline Production

Again, using the canning industry as a parallel, higher speeds were not obtained by the use of additional personnel, but from the use of straightline production methods where each segment of the line produced its share. This was not done by simply building higher speed machines. As each machine was speeded up, closer and closer controls had to be kept on the materials going through the machines. Obviously, the value of higher speeds is lost if a machine is down 15 minutes out of every hour. In order for automatic equipment to function properly, every item that is fed into it must be as nearly identical as possible. Here the production man places himself in the hands of his suppliers. And, as any production man knows, there is nothing more discouraging than to watch a smooth running machine going at full speed suddenly jam, because of an imperfection in one package.

Probably one of the most auspicious days in the packaging world was the day that the first batch of corn flakes was run. This started an era of packaging that eventually must affect the frozen food industry. Here was a case where the finished package could be worth more than the product packed—and the actual cost of the package was not high! The one obvious answer to this was to turn the packages off the end of the line with a maximum of speed and a minimum of labor. Cereal companies improved their packaging technics to get these products to customers in better condition at lower cost.

Machinery manufacturers have done an excellent job of designing equipment to give the cereal packer high speed production for his package. It makes little difference whether the product requires a carton with an inner liner, an overwrapped carton, a bag inside of a carton, an unsupported bag or any combination of these, the cereal industry can usually obtain a group of machines designed for the requirements of their products.

Warehouse Trains Pick Stock For Retail Grocery Stores

Trains, each consisting of an electric tractor and four trailers, are operated in this grocery warehouse by three-man crews, who assemble retail store orders from among some 2,000 items. The system is inexpensive. The men work on a bonus

AMONG the different methods employing chutes, towlines, conveyors and tractors to pick orders in wholesale grocery warehouses, electric industrial tractors pulling trains of hand-truck trailers provide a cheap and flexible means of assembling store orders. This is the method employed by the National Tea Co. in its six-story grocery warehouse in Chicago.

It is cheap because the cost of order picking and replenishing the order-picking stock averages 5.1 cents per cwt. with existing 1946 Chicago warehouse labor rates. It is flexible because the size of the train may be regulated to suit the orders to be assembled and the route of the train modified to accommodate items to be picked up.

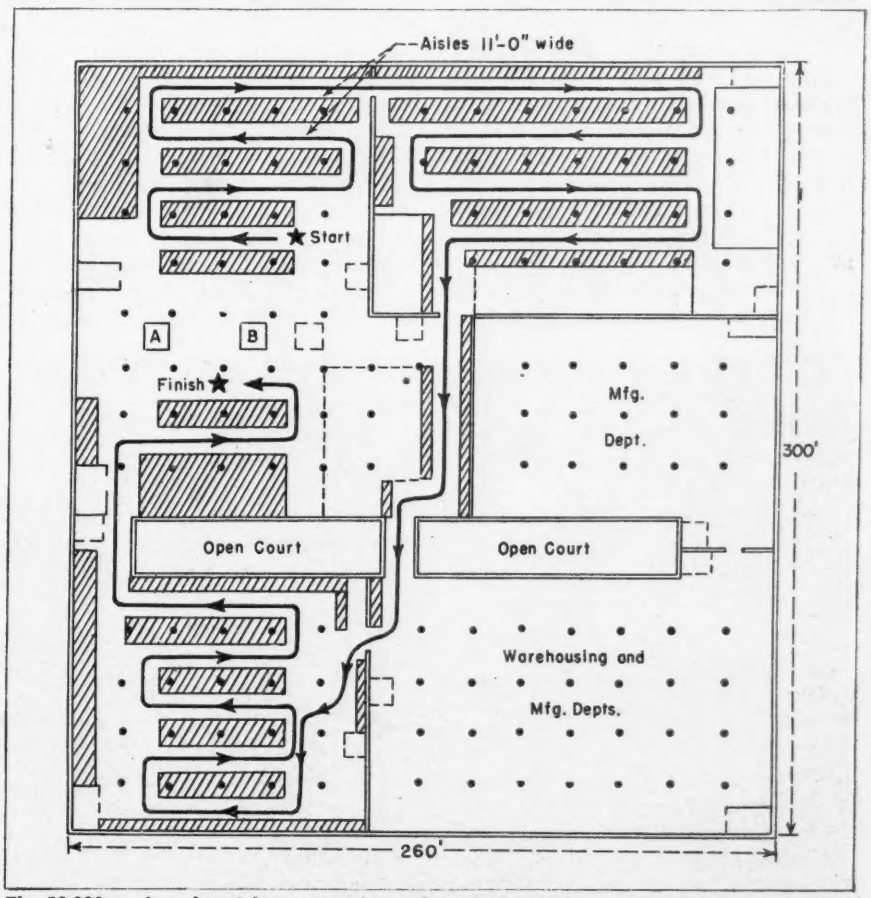
Approximately 1,200,000 lb. of grocery orders are assembled daily and delivered to some of the 484 retail stores in the Chicago area by a fleet of 49 tractors and trailers and other, hired equipment.

The company's warehouse, consisting of six stories and basement with a gross individual floor area of 78,000 sq. ft., has a total gross area of 546,000 sq. ft., of which 160,000 sq. ft. is used for the actual warehousing of groceries. The difference, 386,000 sq. ft., is used for manufacturing departments including bread and cake baking, coffee roasting and service work, such as general office, laundry, lockerrooms, shipping, receiving, etc.

The majority of the 160,000 sq. ft of actual grocery storage space is located on the fifth and sixth floors of the building. Of the total of 160,000 sq. ft., approximately 50,000 sq. ft. is set aside for order picking on the fourth floor. Goods from the surplus stocks on the fifth and sixth floors are moved via platform lift trucks and elevators to the order picking or assembly area on the fourth floor. There they are stored as shown in the accompanying floor plan drawing. They are assembled into retail store orders by crews of three men operating the tractor-trailer trains shown in the other illustrations.

Each train consists of a four-wheeled Mercury electric industrial tractor, made by the Mercury Mfg. Co., Chicago, and three or four hand-truck trailers. The Mercury tractor is operated by electric storage batteries carried on the tractor and recharged on the premises.

While the tractor has four wheels, all on solid rubber tires, the two front wheels are placed side by



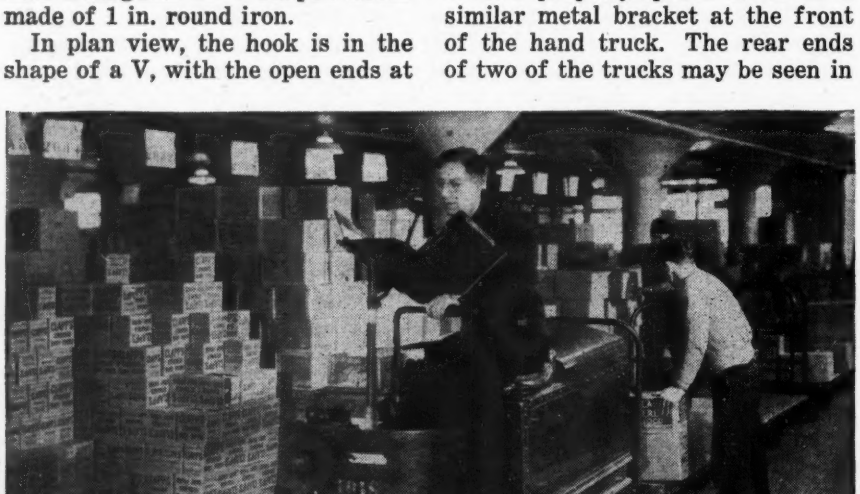
The 50,000 sq. ft. order picking space located on the fourth floor of the National Tea Company's six-story wholesale grocery warehouse in Chicago with the grocery items arranged as shown in the shaded areas and picked from both sides of 11 ft. aisles. The retail store orders are picked up by the Mercury electric industrial tractor and four hand truck trailers shown on the opposite page. The order is completed by the train travelling once around the 1,700-ft. path between the two stars representing the Start and Finish in the direction indicated by the arrows. When the order is completed, the tractor train is broken up and the loaded hand trucks are moved two at a time to the loading dock on the ground floor to the automatic push-button elevators A and B.

The order-picking items shown in the shaded areas in the drawing on the opposite page being replenished by a platform lift truck from surplus stocks carried mostly on the fifth and sixth warehouse floors. Note that with the lift truck about to deposit its load at right angles to the face of the stock, the 11 ft. width of the aisle leaves enough space for the order picking tractor train to pass without delays.

side only a few inches apart. This in effect provides a one-wheel front support which enables quick and extremely sharp turns to be made.

The trailers are wood-floored, metal-framed hand trucks with a fixed two-wheeled rear axle and two caster wheels on the front. The hand trucks are connected to the tractor and to each other by removable triangular or V-shaped hooks made of 1 in. round iron.

In plan view, the hook is in the shape of a V, with the open ends at the rear and the bottom of the V at the front. All three ends are bent down at right angles to provide the hooking action. In operation, the hook at the closed end of the V is inserted through a hole in a horizontal metal plate fastened to the rear of the tractor and to the rear of the hand trucks. The hooks at the open ends of the V are inserted in two properly-spaced holes in a similar metal bracket at the front of the hand truck. The rear ends of two of the trucks may be seen in the picture showing the loaded trucks coming off the elevator in the illustration on the last page.



Just starting on its order picking trip, the Mercury tractor and four hand truck trailer train is operated by a crew of three men. The checker drives the train and calls off the items to be picked up from the preprinted orders carried on the hinged three-part shelf or desk on the front of the tractor. One picker works on each side of the train and picks the items called out by the checker from his own side of the aisle. Each trailer can carry about 75 items or 300 for the four trailers. Note the item number signs suspended from ceiling wires over the corresponding stocks.

The hooks are about 1½ ft. long lengthwise of the V with the bent down ends about 4 in. long. Four such hooks are required to make up a train of the tractor and four hand-truck trailers.

When connected as above, the caster front wheels of the hand trucks and the turning action of the one point connection at the bottom of the V hook permit all of the hand trucks to track after the tractor or follow the leader in making all turns. To disconnect a train, it is only necessary to lift up the hooks by hand, when the loaded trucks can be pushed where desired and the hooks used to make up another train of empties.

The tractor is 3 ft. 3 in. wide and about 6 ft. long. Each hand truck is 3 ft. wide by 6 ft. long. Thus a train of tractor and four trailers is 36 ft. long made up of five units of 6 ft. length each and four spaces of 1½ ft. each between the units.

The propulsion storage batteries on the tractor are carried above the frame in a metal casing at the rear. Ahead of this casing is the driver's seat; a vertical tiller steering column and at the extreme front on a vertical standard, an electrically-lighted, three-part, hinged shelf or desk on which are carried the paper orders for the items to be picked up. Current for the desk light is taken from the tractor's batteries.

Preprinted orders are used, with each grocery item given a number. These numbers are arranged in order and the stock is placed in the aisles in the same order. To complete a retail store order, with some exceptions to be given later, the train starts at a certain point and travels once around the sequence of items and ends at another specified point.

The items are stored one tier high on aisles 11 ft. wide with goods taken from both sides of the aisle except when the items are stored along an exterior wall. The aisle width of 11 ft. is important because, with the tractor 3 ft. 3 in. wide, it permits one tractor train to pass another.

The 11-ft. aisle also permits a tractor train to pass while the grocery items are being replenished on pallets or skids from a platform lift truck about 7 ft. long. To place the items properly, the lift truck must squarely approach the face of the goods on the aisle.

The manner in which the items

are stored on the aisles, the starting and finishing points of the tractor train's once-around and the course of the 1,700-foot pick-up path are shown in the accompanying floor plan drawing.

The two-fold flexibility of the tractor-train method is evident from a study of the above-mentioned pick-up path. First, the train may shorten its travelled path by skipping any of the aisles from which no items are to be taken to fill the order being picked up. Second, if the items have to be rearranged for any reason, the tractor train can adjust its path to accommodate the change.

The tractor train is operated by a crew of three men consisting of a checker, who drives the tractor, and two pickers, one working on each side of the train. As the train proceeds, the checker calls off the number of items as called for on the order on the desk in front of him and the picker on whose side of the aisle the item is located, picks the item off the stack and places it on one of the trailers.

Once around and the order completed, a check is made on the number of pieces on the order and the number actually on the trailers. These must agree or else the error be found and corrected before the train is broken up and the loaded trailers dispatched to the ground floor by automatic elevators for unloading into the road trailer for delivery to the stores.

The order accompanies the goods to the ground floor where the unloading crew makes a second count on the number of pieces. If the count does not agree, the crew must go to the ground floor and correct the error at their own expense.

On the day shift the checker is paid $1.00 per hour and the pickers 95 cents per hour on an 8-hour day with 1½ time over 40 hours per week. On the night shift the base rates are respectively $1.05 and $1.00 per hour. In addition, each man in the crew is paid a bonus of $0.0021 per hour per piece, starting with 83.3 pieces per man per hour. A guaranteed bonus of $0.2601 per hour is paid for 144.5 pieces per man per hour.

At the above rate, the crew of three men will pick a total of 144.5 pieces times 3 men times 8 hours equals 3,468 pieces in an 8-hour day.

Each trailer holds about 75 pieces with a total of 300 for four trailers. This is equivalent to 11.5 trips or orders picked per day per three-man crew.

Nearing the end of its order picking run, the tractor train shown above is almost completely loaded. The driver checker is checking off the items as the pickers on both sides of the train are depositing items on the load. Not all of the grocery items are stocked on the tractor order picking run. Small items such as extracts, spices, cigarettes, etc. are assembled and packed in a separate packing room on the fifth floor and forwarded to the shipping floor to meet the other part of the store order. Heavy items such as flour, sugar, soap, soap powders, etc., are stored on the ground floor as close as possible to the road trailer loading platform to minimize the length of the in and out haul.

Two loaded hand trucks filled on the order picking run as shown in the illustration directly above, are here seen emerging onto the ground floor from one of the two automatic push button elevators marked A and B on the floor-plan on the first page of this article. On the hand truck to the right, note the wheels of the fixed axle on the rear end and the caster wheels on the front end which permit the hand trucks to track with or follow the leader while connected in the tractor train. Note also the one-hole rear-end bracket for the V-shaped towing hook used to connect the hand trucks in the tractor train. In the hand truck at the left, note the open center space between the items as loaded. This is necessary to avoid hiding or covering any items of the load in order to get an accurate count of the pieces without unloading the truck.

Axle Load Spread Aids Beer Deliveries

New Orleans brewery employs five-axle tractor-trailer units engineered to conform to Louisiana's legal limits of 18,000 lb. per axle and an overall length of 45 ft.

THE important automotive distribution fundamental that unit delivery costs go down as payloads carried go up is well exemplified in the five-axle tractor-trailer unit used by the American Brewing Co., New Orleans, to distribute cases of bottled beer to its warehouses in the State of Louisiana.

Last April 1, the American Brewing Co. began to supply its local warehouses in Baton Rouge, Lafayette, Lake Charles, Crowley and Alexandria, from its brewery in New Orleans by automotive equipment.

In selecting a vehicle that would carry the greatest possible payload, in this instance cases of bottled beer, the company decided upon the tractor and trailer type of equipment rather than conventional motor trucks. Since a truck can pull more than it can carry, the transformation of a given truck into a tractor-pulling trailer naturally resulted in a greater load pulling capacity.

And the distribution of the larger load over a greater length and more axles gives a unit axle loading no greater on the tractor-trailer combination than on the conventional truck with two axles. This serves to protect the roadways against excessive overloads. The greater length of spacing between the tractor and trailer axles likewise prevents overloading of the highway bridge spans. Both of the above factors are important in connection with the Louisiana roads over which the tractor-trailer operates.

Going from fundamentals to details, the State of Louisiana allows an 18,000 lb. axle loading and a maximum of 64,000 lb. on a six-wheel tractor and a four-wheel semi-trailer with an overall length of 45 ft. While the state allows a larger gross weight limit of 68,000 lb. with a six-wheel truck pulling a separate six-wheel trailer behind it, it is difficult if not impossible to make up such a combination within the legal length of 45 ft. overall, unless the commodity carried is of extremely high density.

Best Type

But beer in cases is not a high density commodity because of the spaces between the bottles. Accordingly, the six-wheel tractor and the four-wheel semi-trailer type as shown in the accompanying illustration was chosen as the type permitting the greatest possible gross weight and payload.

The greatest possible gross weight of the unit shown by axle loadings would thus be 18,000 lb. times four axles—the two tractor rear axles and the two semi-trailer axles—or 72,000 lb. plus the weight carried on the tractor front axle, usually about 8,000 lb. with a tractor having its engine out in front, a total of 80,000 lb. But as the five-axle unit is limited to 64,000 lb., the limiting factor is the gross weight and not the axle loading. To stay within the gross weight of 64,000 lb. the four rearmost axles of the unit each carry less than the allowable 18,000 lb. per axle.

The makes of the vehicle units selected to compose the combination consist of a Mack Model LF Thermodyne tractor with a Tructor third axle and a 31 ft. Trailmobile trailer with a panel body. The trailer, with an overall width of 96 in. and a height of 6 ft. 6 in., carries a total of 964 cases. At an average weight of 45.5 lb. per case, the actual payload carried is 43,862 lb. This allows an empty tractor and trailer weight of 20,138 lb. to reach the allowable gross weight of 64,000 lb.

The unit shown is equipped with 10.00-20 tires all around. Eighteen tires in all carry the load. Two spares carried under the floor of the trailer serve as replacements for any of the tires on the combination. To date the unit has proven entirely satisfactory in every respect. Gasoline miles have averaged between 4.5 and 5.0 per gallon with the maximum gross weight of 64,000 lb.

No keg beer is carried. The trucks serve warehouses in Lafayette, Lake Charles, Baton Rouge and Alexandria. The most distant point is 214 miles one way from the brewery in New Orleans. Empty bottles in the original shipping cases are brought back to the brewery on the return trips.

The unit makes an average of six round trips a week and averages over 2,000 miles. The round trips from New Orleans to Lake Charles and to Alexandria are each over 400 miles. That to Lafayette is about 225 miles round trip and that to Baton Rouge, 150 miles.

A total of 964 cases of bottled beer is carried in this unit from the American Brewery Co.'s plant to warehouses in Lake Charles, Alexandria and other equally distant points.

EDITORIALS

LAURENCE V. BURTON, Editor

Confused Year End Trends

ODD, sometimes contradictory, facts have come to light during the last few weeks. Certain items of canned foods are now in such generous supply that 1947 Victory Gardens do not make sense. Planned big farm production makes sense if other nations will buy the surplus. For them to be able to buy, we must, however, engage in international trade on a scale greater than ever before.

The 1946 wheat crop was larger than expected, yet as a nation we are failing to deliver the promised UNRRA export wheat quotas. Our failure is said to be due to a shortage of box cars. What has become of all the freight cars is a mystery.

The president of one of the big railroads recently stated that his road had ordered and built many new and improved freight cars, but as soon as they were put into service they seemed to disappear, becoming only figures on their car service reports. The better the freight cars, the less the owning line ever sees of them.

One flour miller's recent troubles stem from the car shortage. In order to get enough empties for current shipments of manufactured products the company has been buying more wheat than it can grind. Its grain inventory, somewhat out of balance as to grain types, has been growing faster than current demand requires. Nevertheless its other inventories are well in hand and properly balanced. But it is getting the cars.

A manufacturer of processed cereals, astonished at the rate at which his finished goods have been going into consumers' hands, had calculated that his "pipe lines" should have been filled up by the first of November. But the demand kept up. Fearful that the goods were piling up in the trade, he ordered a survey, only to learn that the goods are actually leaving the retailers at a rate hitherto unheard of. "Our foods are good, but I can't dare believe they are that good." Big question: are the people eating the goods, or stocking them in their pantries?

A prepared mix maker has had less trouble obtaining shortening than soda. Demand for soda ash, for glass making, seems to have been a big factor in the odd baking soda shortage.

Many a food manufacturer has been watching the declines in soft goods. It started with mink coats from $3000 down to $2195, extended to women's cloth coats, men's hats and other things that take folding money. Word went out to reduce food stocks lest price cuts become general and catch them with big inventories. However, the soft goods price decline has induced a healthy wariness on the part of all food processors. Some have actually received cancellations of orders, mainly in luxury items. Some of the cancellations for staples have been welcomed by non-seasonal manufacturers who are months behind on orders. Part of the cancellations are due to an effort of distributors to let inventories dwindle, part due to fear of the future.

Much of the trade gossip is about inferior quality frozen foods in storage. The quality is not due to deterioration but was made that way by unwise or uninformed manufacturers.

Inventory troubles, appearing in the hard goods (durables) industries, are due to slow deliveries of materials and component parts as promised by suppliers. Some machinery builders are facing acute financial problems, also production problems, as a result of the accumulation of half-completed goods and unbalanced inventories.

Most of our industrial problems would disappear if everybody would stop striking and go back to work.

Potato surplus is a real headache for the U. S. Dept. of Agriculture, which is obligated to support prices for another year. Destruction by fire of two potato starch plants hasn't made it any easier. Government is trying hard to get the surplus processed in any way possible.

What does it all add up to? Confusion, cross currents, fears, but no definite trends—yet.

Problems of Reduced Fat Consumption

APPARENTLY as a direct result of wartime shortages and price control and black markets, some of the fatty foods are facing a difficult future. Butter sells at a retail price between $0.80 and $1.00 a pound. Such a figure merely extends the effect of wartime rationing. People have learned to get along with less butter than formerly. Prewar per capita consumption was about 16 lb. In many families, however, consumption of butter was more than double that figure. Wartime rationing did not reduce the total consumption by impressive figures but it did equalize butter consumption to an amazing extent.

The 5 to 8 percent of the families with the prewar butter consumption of better than 20 lb. per person were forced by rationing to reduce consumption to about 8 to 10 lb. per person per year. We have queried a few of them by asking: "If butter sold for $0.40 instead of $0.90 a pound, would you buy any more than you do now?" The predominant answer is substantially this: "No, we have learned to get along on so little that I doubt if I would buy any more than I do now. I might use a little more for cooking but certainly no more on the table."

The foregoing commentary can be confirmed by observing the butter plates in restaurants. In spite of the diminutive pats of butter served, not

all of it is consumed. Our observation is that about one person in eight leaves a part of his butter.

It will take a long period of promotion to restore prewar rates of consumption. A target to shoot at is the Australian prewar rate of 34 lb. per person per year.

In the case of shortenings the problem of reduced consumption originated in wartime rationing and was perpetuated by postwar scarcities and later by excessively high prices. Fat shortage is always a feature of a wartime economy.

The tight situation has been alleviated somewhat by the use of "extenders," really emulsifiers, in commercial baking. These are edible emulsifying agents. One pound used in this manner has been making one pound of shortening do the work of from one to three pounds in many bakery products. Their use is growing rapidly. Will these emulsifiers permanently reduce the industrial market to about one-third its prewar size? Many informed persons say definitely no, that this is one expedient that will not last.

Going outside the food field the story on soap is much the same. Scarcity has created an opportunity for synthetic detergents to gain access to the consumer kitchen and may displace the market for large quantities of inedible fats used in laundry soap manufacture.

Nevertheless, the foregoing changes in the uses of fats indicate a problem of considerable magnitude before the several fats regain their former economic position.

Any way you look at it, the fatty foods face larger problems of recovering their prewar consumption rates than any other group of food stuffs.

Lower Costs of Materials Handling

EXCEPTING only liquids that can be pumped, and free flowing granular or powdery solids that are easily chuted, conveyed or blown, the cost of handling all other types of materials and packages in the plant is one of the largest items of expense of food manufacture. Materials handling generally ranks next to the cost of the raw materials undergoing process. It is a field of investigation that should receive more attention by the food technologist instead of being left to the operating staff or who ever happens to take an interest in it.

"Happens" is used intentionally in the preceding sentence. Too often the systematic study of unit operations is neglected. Materials handling is merely one of the twelve unit operations (call them manufacturing methods if that makes it easier to comprehend) used in all food processing plants. In a chemical process industry, the chemical engineer is regularly employed to study and perfect the unit operations utilized in the manufacturing process. The food processing industries, on the contrary, seldom pursue this form of continued systematic review of methods, technics or unit operations.

Admittedly, not everyone is qualified by previous training to study unit operations, but there is no reason on earth why he cannot train himself by study and contacts to do so.

As the times change and we pass from a seller's to a buyer's market, firms that are low cost producers will have the easiest future. The high cost of materials handling in many plants can prove to be a serious handicap in the days to come.

In a recent visit to a company that has been growing rapidly during the past ten years, it was very evident that the outstanding development there was in the field of materials handling. And the interest taken there is phenomenal. Even the president himslf is taking a most "unpresidential" interest in it.

Once the management gets a correct breakdown of the cost of its several unit operations—in contrast to the usual type of cost analysis for pricing purposes, and begins to do something about it, that company will soon become a formidable competitor.

It is never too late to begin.

Are You Prepared for Interruptions?

ONE result of the coal strike should be a decision to reexamine fuel and power sources. The idea should be to insure continuity of operations where perishables are involved. Proposed legislation will not obviate possible interruptions of service or operations, for sleet, floods and earthquakes can do as much harm as a strike.

Diesel-driven standby power plants with an adequate reserve of fuel are excellent insurance against costly shutdowns. They need not be large enough to operate an entire plant to more than earn their keep. And they have been known to keep utility rates in line by handling peak demand loads.

Process steam generators of a standby character should be equipped to fire with the alternative fuel and an adequate reserve kept on hand.

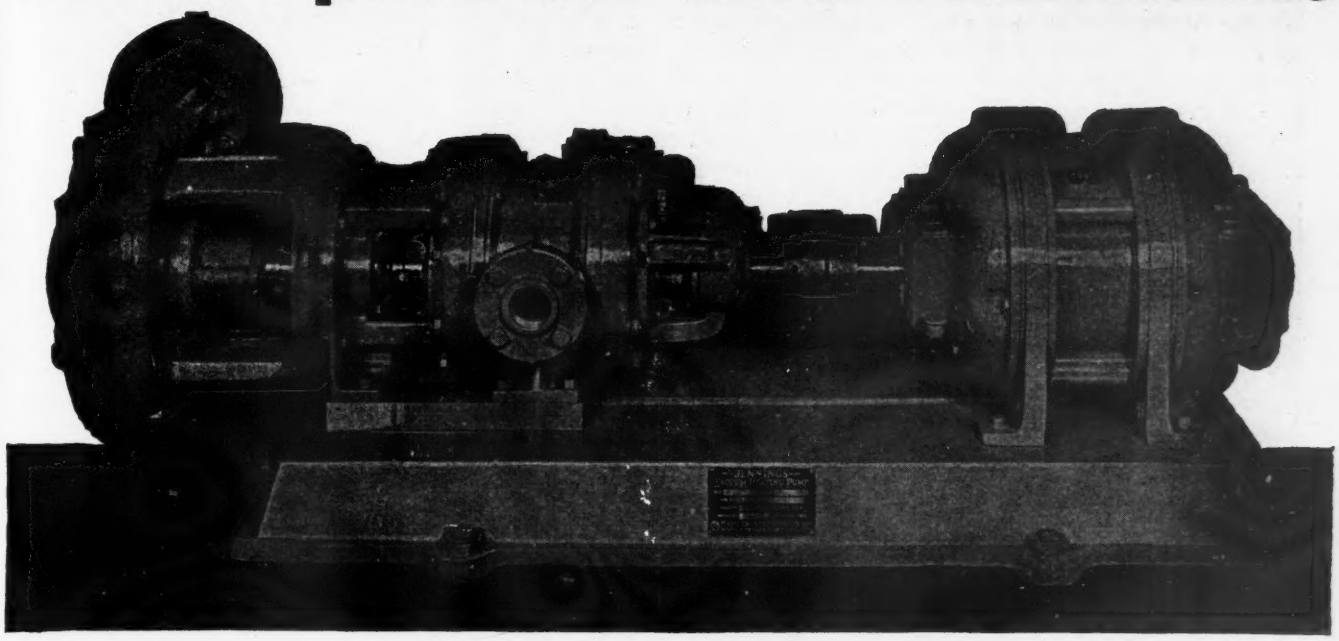
During this trying period, when organized labor is wholly irresponsible, the cost of adequate standbys can easily be lost by a single interruption of essential services.

Plan to Minimize Flood Damage

WHEN heavy snow covers most of the northern two-thirds of the United States, comes a corresponding need to make plans for winter and spring floods. When a heavy snow cover is rapidly melted by a warm winter rain, the run-off may reach flood proportions.

Of course, you cannot prevent floods. But you can minimize the danger. If your plant is located in low land, near a water course where floods may inundate the property, the smart thing is to keep in touch with your local weather bureau or observer to learn about the prospects for higher water. Then, formulate a plan for prompt action in case you are notified of its imminence.

Nash—the Perfected Vacuum Pump for Evaporators and Condensers

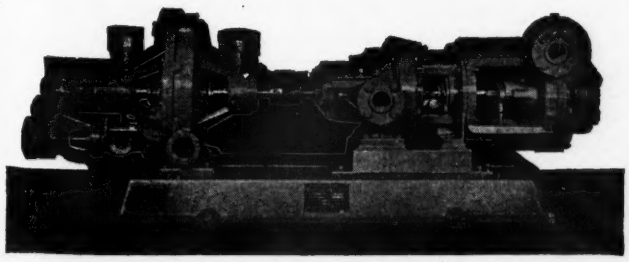


COMBINATION VACUUM REMOVAL UNIT ESPECIALLY DESIGNED FOR SATISFACTORY OPERATION ON CONDENSERS WITHOUT BAROMETRIC LEG

Especially designed for drawing air and liquid from high vacuums, the Nash Vacuum Removal Unit is an efficient combination of a standard Nash Vacuum Pump and a Jennings Centrifugal. This design may be had in either motor or steam turbine drive, and may be installed with confidence that it will operate perfectly.

Nash Vacuum Pumps for Evaporator and Condenser Service offer unusual advantages. Vacuum is non-pulsating, producing uniform operating conditions and assuring a better product. Nash Vacuum Pumps have no valves, gears, pistons, rings, or mechanical complications. The single moving element rotates without metallic contact, and no internal lubrication is required. In standard design these pumps maintain vacuums up to 27" of mercury.

Nash Pumps are compact, and require but a fraction of the space taken by old type equipment. They may be installed where convenient, and they operate at suitable speeds for direct connection to either electric motors or steam turbines. Nash engineers will be glad to recommend proper equipment to exactly meet your particular requirements.



THE NASH VACUUM REMOVAL UNIT MAY BE HAD EQUIPPED WITH STEAM TURBINE DRIVE WHERE THIS TYPE IS PREFERRED

NASH ENGINEERING COMPANY

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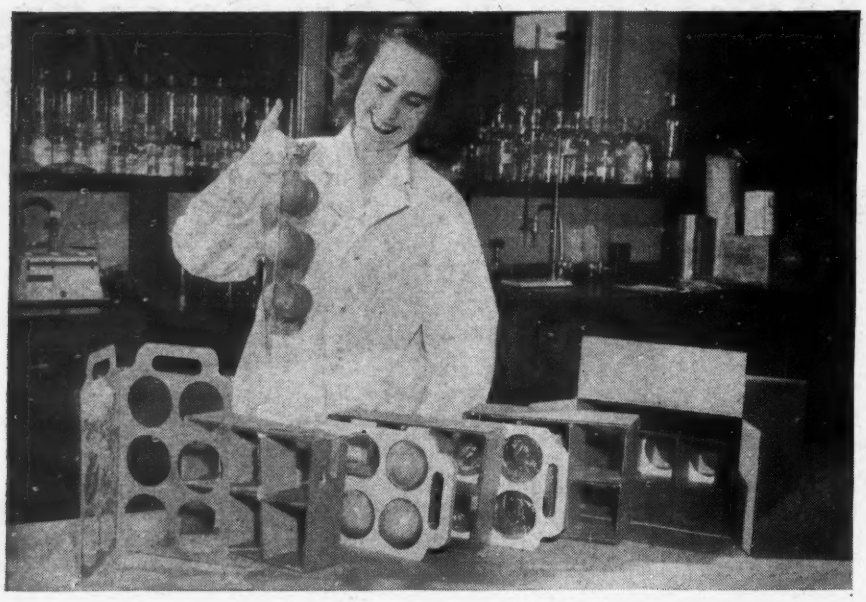
NEW PACKAGES & PRODUCTS



Bruiseless Fruit

DR. SPENCER A. LARSEN, director of Air Cargo Research, Wayne University, Detroit, in conjunction with the Goodyear Research Laboratory, Akron, Ohio, has perfected a method of packaging fresh fruit that should greatly expedite handling and shipping.

"The Hammock Pack" firmly suspends each individual fruit in a pliofilm casing. Two sheets of cardboard form the foundation of the pack. A series of circular holes slightly larger than the diameter of the fruit are cut in the sheets which are then covered with a very thin sheet of pliofilm. In packing the fruit, a slight amount of heat is applied to one piece of cardboard and the fruit is placed on the warm pliofilm over each opening. The pliofilm stretches, forming a "cradle." The second sheet is warmed and placed over the fruit, forming a heat seal. The two sheets of pliofilm stick together but they do not adhere to the fruit.

The shipping carton has partitions so that each piece of fruit rests in an opening and does not touch sides or bottom. Several layers of partitions may be used in one carton.

This method of sealed wrapping preserves the flavor of the fruit, protects it from contamination or bruising and aids the dealer in making attractive displays.

Pliofilm was developed a number of years ago by Goodyear's research division. The film is made by reacting natural rubber with hydrogen chloride.

Rich Fruitcake

A NEW kind of fruitcake, almost solid fruit and called Fruit Jubilee, made its appearance on many of the specialty grocery counters in ample time for holiday shoppers.

H. W. Walker & Co., Chicago, is the manufacturer, this being its first venture into the fancy food field. The confection is made with whole glaced cherries, pineapple, pecans, butter, fresh eggs, shortening and a small amount of flour. It should be chilled and sliced wafer thin for serving.

Packed for gift-giving, it comes in a box with clear acetate dome-shaped top tied with gold cord. A lightweight box and a mailing carton give added protection.

The company also has announced a new icebox cooky assortment in a 1 lb. 2 oz. box. The cookies are made with plenty of butter and natural flavors, including toasted almond, lemon, orange, raspberry, chocolate and vanilla.

Canner Freezes

NINE frozen food items are being test marketed in the Milwaukee area by Libby, McNeill & Libby, Chicago.

Still in the experimental stage, it has been pointed out that any expansion in distribution would have to wait for next year's pack.

Products now being packed under the Libby brand name are black pitted cherries, raspberries, boysenberries, strawberries, peaches, asparagus, peas, cauliflower and broccoli.

Extensive advertising is being carried on in Milwaukee. About 350 retail dealers are selling the frozen items which are packed in cartons with descriptive labels.

Butter Follows Trend

A LAMINATION of aluminum foil and light parchment paper soon will appear on the market as a new butter package.

The new wrap, developed by Reynolds Metals Co. in cooperation with Beatrice Foods Co., Chicago, will protect butter against loss of weight, score reduction and contaminating odors from other products or foods while in storage warehouses, retail outlets or home refrigerators.

Aluminum foil long ago proved its value to the dairy industry. Tests show that the foil alone is as good as or better than the conventional parchment and carton combination. It is said to wrap closely to the product, to be light and moisture-proof and to handle well in automatic packaging equipment or by hand.

Beatrice Foods expects to begin distribution of its Meadow Gold Butter in the new package early in 1947.

Versatile Package

HERE is a package that has been designed to achieve maximum value by using both horizontal and vertical positions.

Magic Chef Macaroni Dinner, product of Kurtz Brothers Co., Bridgeport, Pa., is now packaged in a fiber canister with metal ends, furnished by the American Can Co. It is Ster-Ray Sealed by the Hygeaire process.

The label is striking, simple and readable. Net weight is 8 oz.

Apples For Juniors

NEWCOMER to the canned food line for young children is Gerber's Chopped Apples.

Spurred by the demand for more fruit products for youngsters, Gerber Products Co., Fremont, Mich., has packed bite-sized apples in 4¾ oz. tins.

Months of research have gone into the problem of removing seed cells, those cellophane-like wrappings around the apple core. Considerable study likewise went into the blending of various varieties of apples to obtain the best texture, color and taste. Sugar is the only added ingredient.

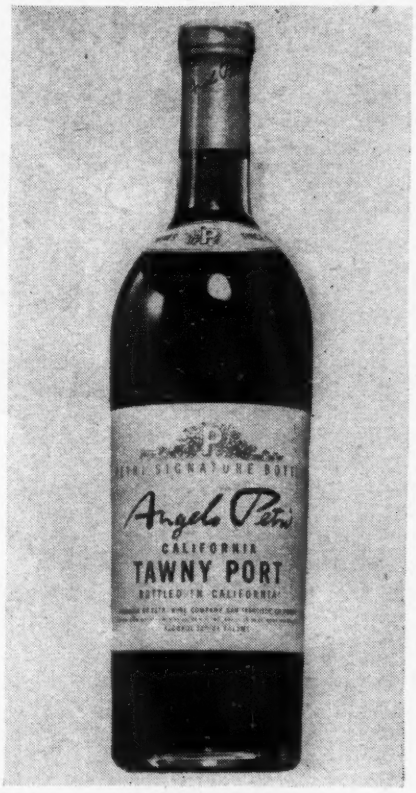
The product is being distributed nationally.

California Wine

A NEW high quality wine, ready for market after many years of research and development, has been announced by the Petri Wine Co., San Francisco.

The introduction to the public is in the form of colorful and aristocratic advertisements in national magazines. The company calls the Angelo Petri Signature Bottle its greatest achievement in its wine making history.

Signature Bottles are produced and marketed in many California types, including tawny port, muscatel, dry sherry, cream sherry, sauterne, burgundy, Rhine wine, Zinfandel and Aleatico.



Pie Artist

MONROE BOSTON STRAUSE, said to be the pie king of the nation, is the creator of the Boston Strause Oven Ready Frozen Pie, produced at a pilot plant in National City, Calif.

As a rule, Strause concocts his own recipes and licenses bakeries to make them. His frozen offerings include berry, apricot, apple, mince, cherry and peach. They are all done except for the baking and are packaged in a super-attractive square carton with flap closing.

A golden brown pie on a pale blue background occupies the face of the container. The sides have pictorial directions for use.

Self Rising

WHEN the flour emergency was ended and flour brands began returning to the market, one nationally known cake flour was accompanied by a new sister product.

Swans Down Self Rising Cake Flour is the newcomer, being the product of Igleheart Brothers, Inc., Evansville, Ind., Div. of General Foods Corp. Baking powder and salt are added, saving time and mess on the part of the housewife.

The pasted paper covered carton is green with a large white swan. Panels and back are given over to recipes and directions for use. A leaflet inside provides more recipes. Directions, too, are given for using this mix in regular recipes.

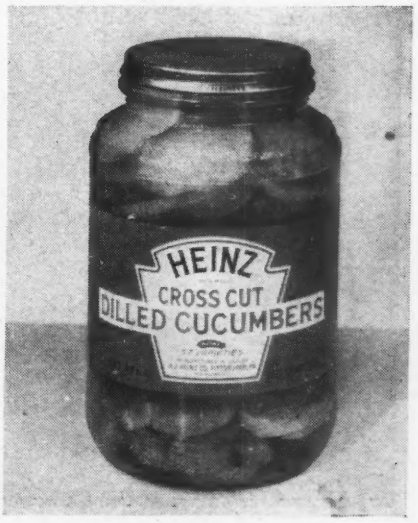
Net weight is 1¼ lb.—568 g.

Cukes

CROSS CUT DILLED CUCUMBERS is a recent introduction of H. J. Heinz Co., Pittsburgh.

Packed in a newly designed 24 oz. jar, the "cukes" are crisp and of good flavor.

The product contains no extra sugar content and is comparable in price to the company's fresh cucumber.



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FOOD INDUSTRY NEWS

GENERAL

Drop In Citrus Prices Speeds Industry's Return to Normal

Carryover, though not too high, may result in a smaller pack unless moved before new season gets into full swing

PRICE as a business factor has returned to the citrus juice industry, engaged in the transition from a high priced pack of last year to a low priced pack now going into the cans. A record citrus crop is in prospect and as the season gets under way buyers are proceeding cautiously. Fruit for processing is going for less than the prices for the fresh market.

Early December reports indicate prices for the new citrus juice pack will be well under the prices prevailing a year ago. Orange juice prices by the canners are $1.05 per dozen for No. 2 can, as compared with $1.50 a year ago. Grapefruit juice is quoted at 90 cents against $1.10 a year ago. It is estimated by canners that if present prices hold there will be a good pack. High prices last year were due to spirited bidding by packers and by a large volume of the crop going into fresh fruit channels. The grower will get less for the 1946-47 crop than last year.

Packers report that the citrus juice market is well stocked and that consumer resistance to present high retail prices is becoming more pronounced. Canners report that unless a considerable portion of present stock is moved before the packing season a small pack may result.

Object of most concern is the carryover, particularly of grapefruit juice. In recent months the stocks have been worked down and the figures look much brighter than they did last June and July. The November 1 carryover, as estimated by the Department of Commerce at approximately 7,000,000 cases (24 No. 2 cans) is the largest carryover on record, but so was last year's pack, and percentage wise the industry appears to be in a normal condition.

Department of Commerce figures follow. Estimates for last year and the carryover into the present pack year have been revised to conform with the information in the hands of the government November 15.

Combined Totals—Canned orange juice, grapefruit juice and orange and grapefruit blended juice, in millions of cases. Basis—24 No. 2 cans.

Annual total supply		Annual pack	Domestic shipment	Carry over
1934–35....	3 7	3.6	3.1	.1
1934–36....	4.2	3.5	3.6	.6
36–37.....	8.9	8.1	6.7	.6
37–38.....	12.1	10.5	7.7	1.5
38–39.....	17.3	13.8	11.5	3.4
39–40.....	18.9	15.9	14.6	3.0
40–41.....	26.4	22.8	18.1	3.6
41–42.....	25.9	19.9	17.9	6.0
42–43.....	33.9	30.6	16.8	3.3
43–44.....	47.5	40.9	25:7	6.6
44–45.....	54.2	48.5	33.5	6.4
45–46.....	67.3	62.2	60.5	5.7
46–47.....	74.0	70.5	64.4	7.0

These figures show the phenominal rise in sales and production that took place during the war. They have been interpreted to indicate that the market has not yet reached the saturation point providing the industry does not price itself out of the market. Citrus juices are under pressure from the very large crop of deciduous fruits and from pineapple juice from Hawaii that is now reaching the domestic market.

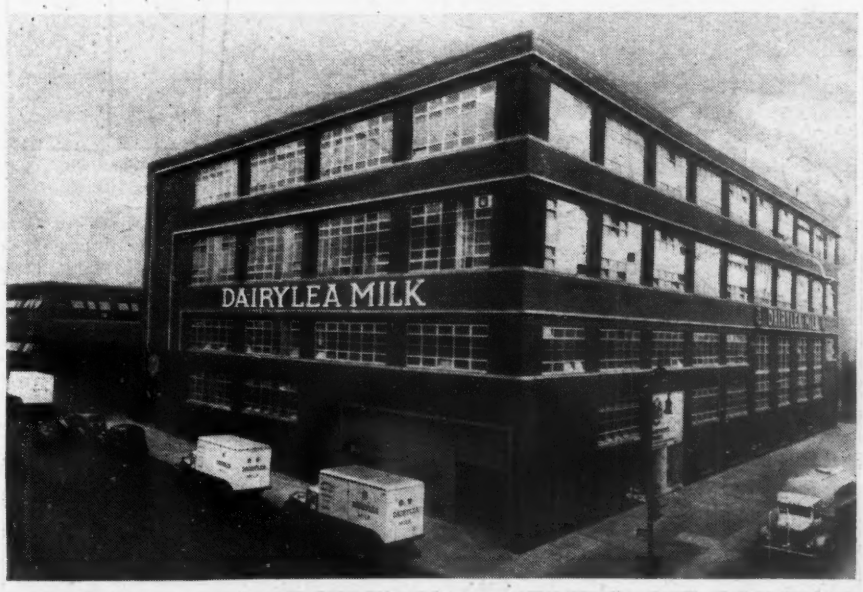
The statistical picture also shows that the most of the stocks remaining on hand have been passed along to the retailer and that packers and wholesale and chain store warehouses are ready to handle the record breaking pack in prospect. For comparison, the carryover of canned fruits normally is 30 percent, 10 percent in the hands of the packers and 20 percent in the hands of the wholesale and chainstore warehouses. The citrus juice carryover last year is estimated at less than 10 percent at the same level.

Any labor disturbance, which cuts the production of tin plate, could curtail or stop the pack of citrus juices. In that case, stocks carried over from last year would be a great asset.

Gorrell Tribute

THE canning industry has about completed plans for the testimonial dinner to Frank E. Gorrell, to be held in the banquet hall of the Atlantic City Auditorium, January 21. The event, taking place during the National Canners Convention, gives the industry a long sought opportunity to pay tribute to the first secretary of the National Canners Association, who held that office for 38 of the association's 40 years.

The price of the banquet tickets is $8.50 each. Reservations may be made through Miss Helen Tate, National Canners Association, 1739 H. St., N. W., Washington 6, D. C.



NEW MILK PLANT FOR NEW YORK

The Dairyman's League Cooperative Association opened its new Manhattan milk plant last month. The plant, built by the coop's 26,000 farmers can handle 60,000 lb. per hr.

Hawaiian Sugar Strike Damage More Severe Than War Ravages

HAWAII'S sugar industry suffered greater losses from the 79-day strike, ended November 19, than during the entire war of the Pacific in which the islands served as the nation's spearhead, according to H. Alexander Walker, president of the Hawaiian Sugar Planters' Association, in his annual report.

In summing up the effects of the war, President Walker said production losses of the plantations would have been overcome by the end of 1947, but that the heavy damages resulting from the island-wide strike of Harry Bridges' International Longshoremen's & Warehousemen's Union could not be entirely overcome until 1950 or 1951.

"Before a factory goes on strike the switches are pulled and the machinery is stopped, but you can't stop nature when plantations are struck," he said. "Lack of irrigation during nearly 12 weeks of strike injured or completely killed more acres of sugar cane than were abandoned for lack of manpower during the war.

"Hawaii's sugar mills could have turned out nearly 190,000 tons of sugar during the period they were idled by the strike," he continued, "enough to supply the country's total needs for 13 days in this period of acute shortage, while the handicaps of war caused the islands' annual production to drop only 180,000 tons below the normal level of 1,000,000 tons a year."

The island sugar executive pointed out that the ILWU contract covering the entire Hawaiian industry was the first of its kind ever applied to agriculture on a comparable scale. Industry-wide unionization was made possible by Hawaii's so-called "Little Wagner Act" which includes agricultural workers under its provisions. Out of 28,500 sugar employees in the islands, 15,549 participated in the strike ballot that paralyzed 33 plantations.

Noting reports that the Bridges union, which numbers thirty per cent of its total strength in Hawaii, sought control of the sugar industry here and planned a similar campaign in other sugar-producing areas, Mr. Walker said:

"Judging from public reaction, the assertion is justified that the motives behind this strike encompassed more than the general issues of wages and worker welfare. Tactics employed by the ILWU indicated plainly that preparation of plans for the strike began long before the presentation of new demands . . . . . The vigor with which the demand for a union shop was launched indicated that this issue was a primary objective."

"IF YOU'D PLEASE BRING THE INGREDIENTS I'D LIKE TO MIX MY OWN SALAD DRESSING."

Farm Surpluses Feared By Government Leaders

REPUBLICAN farm leadership in the new Congress is planning to adapt the wartime industrial contract termination technique to the war inspired production incentive programs for agricultural commodities. Involved is an expected revamping of the parity formula and a juggling of the price support levels for Triple-A and Steagall commodities, designed to put an outside dollar limit on the cost to the government.

Rep. Clifford R. Hope, the Kansan who is slated to become chairman of the House agriculture committee, already is on record to the effect that there is immediate necessity for changes in the law that will give the farmer "adequate protection" but keep the cost to government within reasonable, budgetary bounds.

Chief objection of the incoming majority to the operations of present farm legislation is that it tends to subsidize expanded production of a number of agricultural commodities long after the need for bigger crops is gone. What's needed, according to this line of reasoning, is legislation that will do for the wartime food expansion program what was done for business after V-J Day—pay off for what was done and for costs incurred on work in progress, then call it quits.

Prospective surpluses in commodities that can easily be manipulated up or down already are of a magnitude to cause GOP Congressional leaders to wonder audibly where the money is to come from—particularly in view of their commitment to slash the cost of government and cut taxes. Eggs and potatoes already have given trouble and there could be a plaguing surplus of wheat as early as next fall if there should be another bumper harvest.

To accomplish the conversion, legislation is in the discussion stage to rewrite the support provisions of the law to spell out, commodity-by-commodity, the percentage of parity at which government support will begin. At present, except for cotton, the law requires government support at 90 percent of parity for all basic commodities. Also under consideration, as a technique to limit costs, is the possibility of restricting government support programs to specified volume of production.

The Republicans also are giving at least lip service to a revision of the parity formula to include labor costs—a la the Pace Bill of the 79th Congress. This complicates the job of reducing government outlays under the price support program—by increasing parity, but it may become a political necessity in order to achieve the revision in the support program.

A companion bill in the works for Republican sponsorship next year is legislation to provide for an orderly disposal of surplus farm commodities. On this phase of the subject there are as many ideas as there are people talking about the problem, but the surest to figure prominently in the debates is the scheme of Representative Andresen, R. Minn., to export agricultural surpluses in exchange for manufactured goods.

USDA Research Setup Left To Congress

A SEPARATE agency to handle Marketing research in accordance with the expressed ideas of Congress seemed assured after the first meeting of the National Advisory Committee, the group established to implement the provisions of the Research and Marketing Act of 1946 (Flannagan-Hope Act). The next question concerns the stature of the new agency; upon what level it will be established. This was behind the December 5 statement of Secretary Anderson that, "The advisory committee unanimously approved my position that there should not be at this time a final decision as to the desirability of setting up a separate Marketing Administration to carry out the provisions of the new law."

The secretary went on to explain that he wants further explicit instructions from Congress on the form the adminstrative setup required under the new law is to take. "There now exists, in the Department of Agriculture, a Production and Marketing Administration. I

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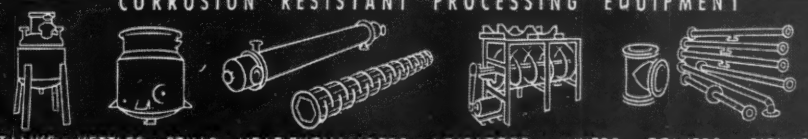


TANKS • KETTLES • STILLS • HEAT EXCHANGERS • AGITATORS • MIXERS • TOWERS • PIPING

STAFF OF LIFE

Convenience in handling was not the chief attribute of this 9 ft., 82 lb. loaf of bread, recently baked by the Northwest Baking Co., St. Louis, for an AFL exhibition.

want clarification from the Congressional leaders and the heads of farm organization on their current thinking as to whether or not the department should take steps to separate certain marketing functions and personnel from the present production and marketing administrative machinery."

At the same time, the Secretary of Agriculture announced the appointment of E. A. Meyer, present assistant director of PMA, to take charge of the planning and programs to be carried on under the Research and Marketing Act of 1946 and to coordinate this work with programs already existing in the department.

Container Shortage Acute On All Fronts

VIEWED from any angle prospects for food containers during the coming year are not bright. The present shortage is acute. Lack of containers may close many plants and cause the loss of vast quantities of perishables, which normally reach the retail market in processed form.

The insatiable demands for aluminum to be manufactured into prefabricated houses for veterans is a contributing factor in the shortage of soda ash needed by the manufacturers of glass containers. The overall shortage of caustics is expected to continue until new production facilities are in operation sometime in 1948. The indicated shortage of soda ash for 1946 amounts to 500,000 tons. A similar situation occured during the war and the industry advisory committee has suggested that the voluntary wartime allocation system be reinstated.

History is repeating itself in the case of tin cans. As in the war, the bottleneck is steel, not tin. The steel and coal strikes of early 1946 are still being felt. Any further disturbances in production of sheet steel will cut the 1947 can supply.

The shortage of steel for the manufacture of both heavy and light drums has caused many manufacturers dependent upon steel containers to curtail their operations. Civilian Production Administration reports unfilled orders for heavy drums are approximately twice what they were a year ago. During 1946 production of light drums actually declined. Unfilled orders for kegs and pails also have risen sharply. Producers' stocks of all steel shipping containers are "for all practical purposes non-existent."

Government experts do not expect increased production of paper board used in the manufacture of corrugated and solid fibre board shipping containers until the end of 1947. Production is adversely affected by the shortage of pulpwood and the shortage of soda ash. Inability of manufacturers of wirebound boxes to purchase lumber and veneer and a developing shortage of wire has reduced the operation of the wirebound box industry to a slow crawl. The shortage of forest products and nails is so great that further competition by the housing program may be expected to bring large segments of the nailed wooden box industry to a standstill.

The housing program is again in direct competition with the food processors for raw material for the manufacture of folding boxes such as cartons for butter, margarine and lard and other wet food packages. Not only is there a shortage of woodpulp, but also a requirement that boxboard mills contribute some of their product to housing in the form of gypsum liner.

Food processors requiring tight cooperage have had difficulty in supplying their demands both because of the shortage of wood and because the distilling industry has purchased or leased almost all of the tight cooperage stave, heading and finished barrel plants. CPA reports, however, an informal agreement by the distillers to process all available oil-grade staves for food and food-product type barrels.

Slack cooperage may be available in larger quantities now that price control has been abandoned. Accurate estimates, however, are impossible at this time.

DISTRIBUTION

Added Food Imports Foreseen by C of C

THE United States, now a heavy exporter of farm products, may face increased imports of competitive agricultural items, the Agriculture Committee of the Chamber of Commerce of the United States predicted recently.

In a report on postwar trade problems related to agriculture, the committee noted:

"At no time in the last 100 years have conditions been so favorable as at present for an expansion of the import trade, particularly in competitive agricultural products. These favorable conditions may mean that the time is not far distant when the traditional policy of the United States with reference to protection for agriculture may undergo more or less substantial modification.

"There is even a possibility," the report continued, "that such products as butter, having a comparatively high unit value, may be imported from Europe before the present shortage in that area is al-

leviated in order that means for purchasing other greatly desired commodities may be obtained. It is reported that, notwithstanding the general food shortage in northwestern Europe, exporters in Holland recently arranged for a shipment of potatoes to Brazil, at the very moment that hundreds of carloads of potatoes were awaiting shipment from the United States to Europe."

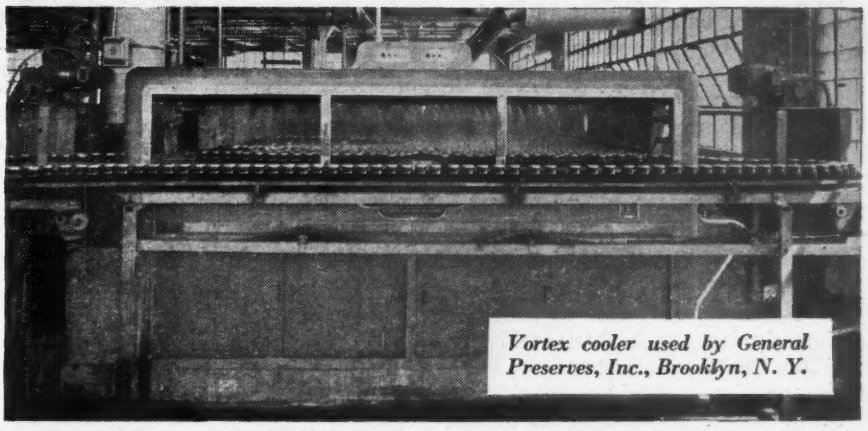
Prospects Bright For Higher Sugar Quotas

ESTIMATES of the 1947 sugar supply have been revived upward by the Department of Agriculture and an increase in sugar rations both for consumers and industrial users has been announced. As stated by Secretary Anderson, "Barring unpredictable disasters, sugar will be available to increase sugar rations in the United States by one 5-pound consumer stamp by April 1, and at the same time to increase rations for industrial users by an additional 10 percent of the 1941 base period."

The move was forecast by James H. Marshall, Director, Sugar Branch, PMA, U. S. Department of Agriculture, in a speech given November 21 before the Miami convention of the American Bottlers of Carbonated Beverages. The figures used by Mr. Marshall indicated that with good fortune another increase might be granted before the end of 1947. Secretary Anderson's statement echoed the same idea. "It is believed," he said, "that the sugar supply situation will warrant further increases later in the year, but at this time it is too early to specify the amounts."

The actual goal of the government is an annual per capita consumption of 86 lb. an increase of 13 lb. from the 1946 level of consumption. The increase announced in December will not be sufficient to reach this goal. That will come later if and when the sugar is available.

In spite of the fears of industry that an abrupt end of all government controls would bring on a chaotic condition, similar to that which occurred when controls were dropped after the last war, the secretary stated the government policy was to get out of the sugar business as rapidly as possible. His exact words were, "The Department hopes that it will not be necessary to make any sugar purchases after the 1947 crops." After explaining the difficulties of estimating future supplies and of determining when



Vortex cooler used by General Preserves, Inc., Brooklyn, N. Y.

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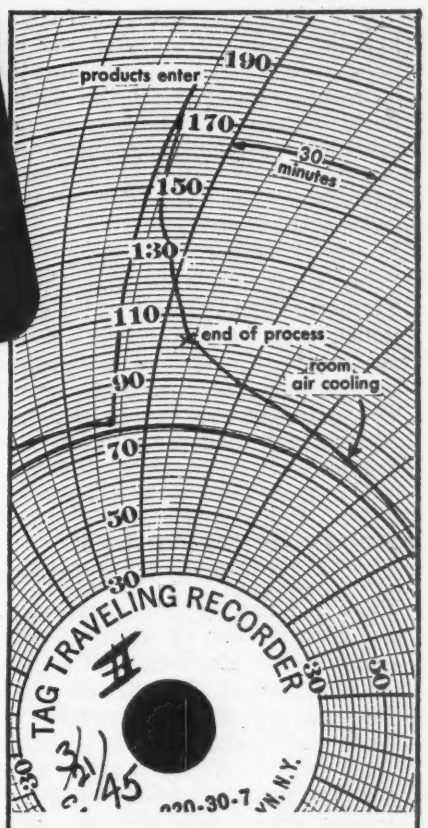

The process recorded above is cooling 1 lb. hot marmalade jars 80° F. within 20 minutes to packing temperature.

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Whatever your problem of cooling—or heating—your products, it will pay you to learn the Vortex method of achieving uniform results economically. Send us your process requirements and write for bulletin No. 87 today.

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there is a balance between supply and demand, he continued, "However, our efforts will be concentrated upon getting the government out of the wartime sugar programs with as little industrial dislocation and price fluctuation as possible. The reestablishment of the sugar futures market for trading in 1948 and later deliveries is one of our objectives."

"I think it only fair to point out that during 1947 there will continue to be a shortage of sugar though not so great a shortage as in the past. Continuation of controls throughout the entire year will probably be necessary to achieve equitable distribution and to prevent extreme price fluctuations."

Official opening of the 1947 sugar grinding season in Cuba was set for January 2. A decree fixing the date was approved by the Cuban Cabinet early in December. It contained a provision that mills desiring to grind earlier could do so upon the prior approval of the Minister of Agriculture.

Because some cane sugar was being imported into the United States as beet sugar that was not under import control, the U. S. Department of Agriculture placed beet sugar under import control. This stopped the bootlegging of sugar that had been going on previously.

World Sugar Consumption

This comparison of prewar sugar consumption with that estimated for 1946, sharply indicates the drop in per capita consumption throughout the world.

Country	Prewar lbs. per Cap.	Estimate 1946
U. S. A.	103.3	78.1
United Kingdom	111.2	78.1
Canada	102.1	78.1
France	57.5	39.6
Netherlands	64.6	53.1
Belgium	69.0	47.2
Norway	75.4	45.8
Sweden (self-sufficient nation)	101.6	89.6
Switzerland	88.4	60.7
Germany (prewar)	56.4	16.8*
Russia	25.8	12.5‡
Poland (self-sufficient)	12.8	12.5
Spain	24.5	11.3
Italy	19.0	7.9
Jugoslavia	12.6	11.3
Czechoslovakia (exporting country)	65.0	63.7
Denmark (exporting country)	122.3	84.0
Greece	26.0	16.8
Finland	63.5	26.5
French North Africa	44.4	19.8

Information from Office of Foreign Agriculture Relations.
* Average for the four zones. American, British and French zones got only about 6 lb. per capita.
‡ Probable, although ration permits 13.5

Heavy Grain Prospect Ends Restrictions

FEAR of unmanageable surpluses in the future, fear of what an economy-minded Republican Congress may do, fear of the final outcome of the price support program have had some part in the modification of the Department of Agriculture's restrictions on the use of grain. Secretary Anderson's strategy is to make the processors of non-food products a market cushion.

A favorable over-all grain situation directly resulting from the record crop of grain in 1946 has provided ample carryover stocks. The crop year about to start will be a year of transition, according to Washington economists, but with production goals still at high levels a harvest comparable to last year's record is possible, barring adverse weather. Substantial exports to ease the world-wide food shortage are in prospect with the business carried out on a cash rather than relief basis. This is expected to prevent real surpluses of the major crops next year, but the ample supplies in sight may soften prices to a point close to the support level, 90 per cent of parity.

This prospect led the Department of Agriculture to:

1. Remove all restrictions on the production of flour for domestic distribution and for export to license-free countries.

2. Remove restrictions against distillers use of grain other than wheat and wheat products, rye, and corn grading No.'s 1, 2, and 3.

3. Liberalize restrictions on brewers use of grain in the manufacture of malt beverages.

American Can Opens New Research Labs

COMPLETION of the new research laboratories and celebration of the founding of the laboratories at Maywood, Ill. 25 years ago as well as the founding of the first Canco laboratory at Niagara Falls, N. Y. in 1906, were celebrated on Nov. 20 by top officials and members of the American Can Co. research division and guests.

The addition of the new laboratories increases the research facilities 25 per cent, or 16,000 sq. ft. Most of the added floor space will be used by the metallurgical, biochemical, bacteriological, fiber container, food inspection and engineering groups.

In their expanded state, the Central Research Laboratories at Maywood are housed in three buildings containing aproximately 81,000 sq. ft. of floor space and have a staff personnel of 280 persons.

Among the many research projects under way is that of the Sealing Compound Group of the Container Research Section on a special compound for the re-close type of small tin can for baby foods and other similarly processed items. Containers of this type have presented an unusual problem in sealing technology.

One of the major activities of the metallurgical group in recent years has been research to improve the corrosion resistance of plain electrolytic tinplate. This work is to be continued on an expanded scale. Mr. Stewart stated that important sav-

CORN HARVESTING

This picture showing a mechanical corn picker, mounted on a tractor and handling two rows at a time, illustrates the relationship of mechanization to record crops.

ings in the cost of cans to food packers will result if electrolytic tinplate is made sufficiently good to be used as containers for processed foods without the application of inside enamel coatings.

Studies on the nutritive values of canned foods are to be intensified by the biochemical group. The new building provides additional hot and cold storage facilities for studying the effects of warehousing on quality and vitamin retention of canned foods.

In addition to the wide variety of work on metal containers, extensive research is being carried on by the non-metallic container group on moisture evaporation through frozen food containers, on the protective qualities of plastic containers, and on the strength and protective qualities of fiber containers for milk and other products. Experimental units representative of three freezing methods are being used in the frozen food studies. Wax coatings as well as fiber board and construction details are under study to obtain the best type of carton for milk and other liquids.

ICC Grants New Rates On Freight Shipments

FREIGHT rate increases granted by the ICC went into effect January 1. Generally speaking processed fruits and vegetables take a 20 percent increase with a maximum limit of 13¢ per hundred lb. Protective services also are advanced only 15 percent but almost all other special services go up 25 percent. Rates applicable to fresh fruits moved up 20 percent and fresh vegetables 15 percent, both with a 13¢ per cwt. maximum limit.

Only uncertainty left is the question of who pays the bill. Washington opinion is that while much of the increase will show up in the retail price of food items the remainder will come out of the packers, wholesalers and retailers and that even the grower may be forced to absorb a small portion.

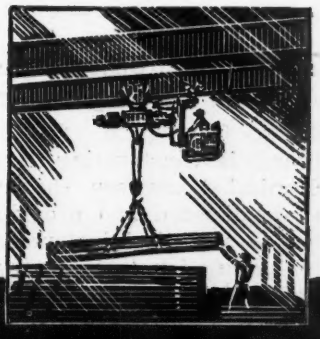
The increases granted by the Interstate Commerce Commission came within 2 percent of the amount the carriers originally sought. The general increase of 25 percent made in the first proposal worked out to only 19.6 percent when all exceptions were considered. The average rate of increase allowed by the ICC ruling amounts to slightly more than 17 percent, which will increase the revenue of the railroads about one billion dollars per year.

PERHAPS YOUR BUSINESS IS DIFFERENT

With so many ways to manufacture, process and fabricate, businesses may be different insofar as shop practice is concerned. But regardless of whatever competitive advantages you enjoy, your material handling problem is common to all industry. Heavy loads must be picked up, moved and deposited with speed, safety and economy.

Shepard Niles electric hoists have, for many years, been handling loads of from 1/8 to 20 tons smoothly, easily and efficiently in every type of industry.

America's oldest builder of electric hoists and cranes offers you a selection from over 5,000 styles and sizes to enable you to get the hoist best suited for your handling job. Without obligation, trained, experienced Shepard Niles engineers will study your handling operations and recommend a hoist to do the job as you want it done.



Shepard Niles electric cranes are made in types and sizes for every kind of industrial lifting and moving. If you have a heavy handling problem, there's a Shepard Niles to do the job. Our engineers will study your need and recommend the best crane for you. No obligation, of course.

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Vi-Co

NATURAL "B" COMPLEX
YEAST VITAMIN PRODUCTS
AND YEAST DERIVATIVES

Plasmolyzed Yeast Extracts
for FOOD and AMINO ACID
PREPARATIONS

Vi-Co Plasmolyzed Yeast Extracts are prepared by enzyme digestion of brewers' yeast to yield a B complex product rich in essential amino acids. Amino acids provide the necessary "building blocks" for healthier and stronger bodies.

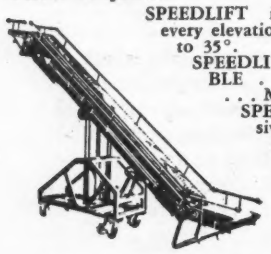
These products possess a definite "meat-like" flavor useful in enriching soups, bouillon cubes, tomato juice and other packaged foods. Such enriched foods are also of value for their natural B complex and high amino acid composition.

Consult us about your vitamin or yeast problems. Our technical staff can best advise you how Vi-Co products can be used to enrich your own products.

VICO PRODUCTS CO.
415 W. Scott St. • Chicago 10, Illinois

PRODUCTION
SPEEDS UP WITH
SpeedLIFT
BELT CONVEYOR

SPEEDLIFT speeds production and cuts handling costs. In warehouses, on loading platforms, freight yards, airports, production lines, mills and plants, docks and wharves, institutions and transfer companies.



SPEEDLIFT is adjustable to every elevation from horizontal to 35°.
SPEEDLIFT IS REVERSIBLE . . . PORTABLE . . . MULTI-PURPOSE.
SPEEDLIFT'S exclusive Start 'n Stop Switches at either end (one reversible) facilitate instant controlled material flow in either direction.
SPEEDLIFT is sturdy, requires no upkeep or repairs. Can be used as individual units . . . as a connecting link in a system . . . or as a feeder conveyor.
SPEEDLIFT is mounted on four 6" diameter rubber-tired casters . . . two swivel type and two stationary. Can be moved easily and quickly by one man.

KEEP 'EM ROLLING WITH
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Represented by experienced Material Handling Equipment Engineers in principal cities.

PROCESSING

Process Butter Laws Extend Beyond Intent

UNTIL Public Law 427 of the 79th Congress was approved last June, the Department of Agriculture had no control over ingredients of process butter. This was an interpretation of the Attorney General, so that control had previously been limited to the finished product only.

A hearing was held in November to consider the proposed regulations printed in the Federal Register on October 30. Four of the five process butter factories were represented at the hearing. Also present were butter manufacturers, dairy equipment manufacturers, and representatives of the Food and Drug Administration and Bureau of Internal Revenue.

The question was raised as to whether ordinary butter, which is made by a continuous process, would be regarded as within the scope of these new regulations. A Bureau of Dairy Industry representative stated that such a question was irrelevant to the present hearing. An official determination of this point is nevertheless expected as soon as possible after the regulations are promulgated. Although the law may be found legally to include such new technology as is involved in the new continuous process, it was not the intent of Congress or the Department of Agriculture when the law was drafted, that such be the case. It is understood that only two such continuous process establishments are now in operation, and it is not intended that these operations be hindered by the "process butter act" or new regulations.

Candy Company Builds Testing Laboratory

BROCK CANDY CO., Chattanooga, Tenn., is constructing a modern chemical laboratory that will be air-conditioned and provided with special analytical instruments and equipment for testing raw materials before processing. Analysis will be made of moisture, invert sugar, pH, melting point, viscosity, and refractive index as one step in the control of standard products.

The Industrial Research Institute of the University of Chattanooga has cooperated with the Brock Company in selecting the equipment, outlining and developing analytical procedures, and training a technician to operate the control laboratory. The company has been sponsoring a research project on improvement of the quality of candy at the Industrial Research Institute.

The new chemical laboratory will enable Brock to test and analyze all raw materials, variation in properties and makes allowances for variation in ingredients before processing. Unavoidable errors in manufacture will be corrected.

Process Stabilizes Brine Cured Herring

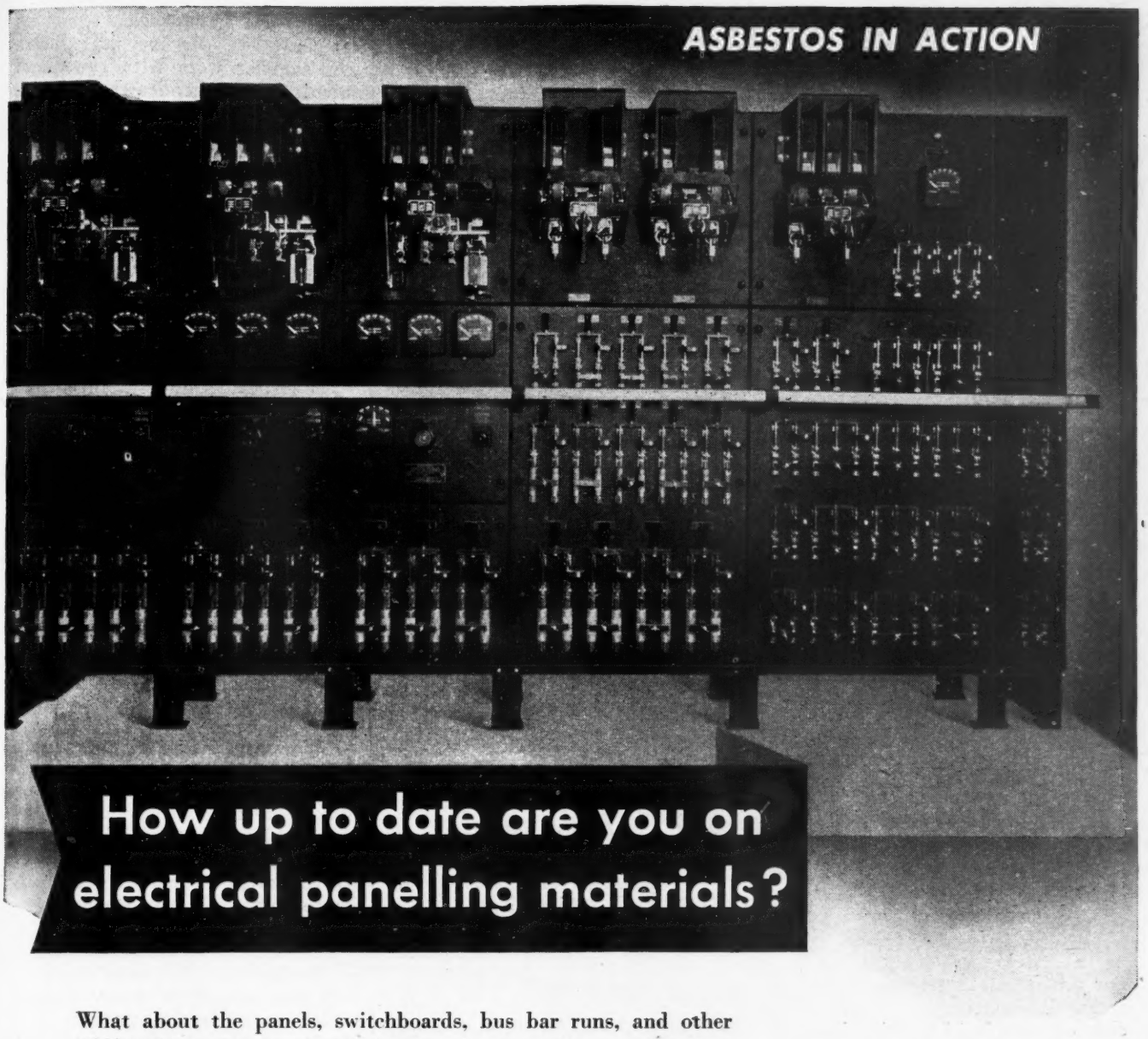
BRINE cured herring treated in accordance with a new process developed during the war will remain stable and edible for prolonged storage periods. A study of the comparative stability of the treated and untreated fish was made recently at the Quartermaster Food and Container Institute for the Armed Forces in Chicago, with Joseph F. Puncochar, U. S. Fish and Wildlife Service, as coordinator on the project.

Tests were conducted to determine a satisfactory method of packing salt cured fish products to provide maximum stability and palatability with a minimum of refrigeration. Two lots of herring were packed over a year ago. (F. I., December, 1945, pg. 84).

One lot was treated with a vegetable oil coating containing nordihydroguairetic acid and placed in brine with benzoate while the other lot was packed according to good commercial practice. Both lots

FROZEN HORS D' OEUVRES

Quick freezing is here being applied to hors d' oeuvres, adding another food class to the growing list of frozen foods. This picture was taken at the Dover D' Oeuvres Co. plant in Long Island City, N. Y., where the delicacies are packed in moisture proof containers, after freezing. These canapes are being rolled prior to cutting.



How up to date are you on electrical panelling materials?

What about the panels, switchboards, bus bar runs, and other electrical apparatus mountings in your plant? Are they proof against absorption of moisture and oil? Do they stand up under high voltage surges, vibrations, and temperature changes, retain a business-like appearance without costly maintenance?

You can answer "yes" to all those questions if your electrical apparatus is mounted on K&M Ebonized Asbestos, the *modern* panelling material. Fabricators who work it and plants that use it say Ebonized Asbestos is ideal for the purpose.

Made of tough asbestos fibres, cement and an insulating compound, K&M Ebonized is moulded into strong monolithic sheets with exceptionally high dielectric strength. It gives extra-long service, in fact it grows tougher with age. Meets the requirements of Underwriters' Laboratories, Inc., when built into an assembled unit. Write us for full technical data on this superior mounting material.

Photograph courtesy I.T.E. Circuit Breaker Co.

Nature made Asbestos...

Keasbey & Mattison has been making it serve mankind since 1873

K&M best in asbestos

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For Fast, Fine, Uniform Grinding

Cinnamon
Dehydrated Foods
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Powdered Milk
Food Colors
Soy Beans
Starches

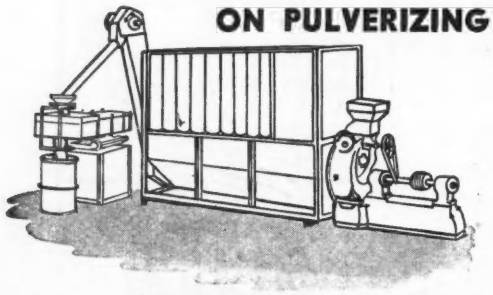
All Barks, Herbs, Roots and other dry, grindable stocks with oil content up to 20% to 30%.

FOR BATCH OPERATION

A Schutz-O'Neill Mill with Receiver Box is ideal equipment. Receiver box relieves air pressure through cloth top, which lifts off to empty or clean box. You can use a separate receiver box for each product.

For general use in pulverizing a great variety of food products, spices, seeds and similar materials, the Schutz-O'Neill Pulverizers are unexcelled. The principle of centrifugal air force impact is fast, produces a uniform product, and will maintain relatively high outputs for superfine grinding up to 400 mesh. For products with high moisture or oil content, Schutz-O'Neill also has efficient and proven equipment. Schutz-O'Neill Pulverizers are made in 12", 16", 20", 22", 24", and 28" sizes, with capacities ranging up to 2000 lbs. per hour, depending upon kind of material and fineness desired.

Consult Schutz-O'Neill ON PULVERIZING PROBLEMS



Mill Plan 45—Mill, expansion Tubular Collector, Elevator, Gyrator Sifter.
An efficient set-up for continuous operation.

Schutz-O'Neill has a great variety of Mill Plans for different purposes. If you will write us your requirements, products to be pulverized, output desired, and send a sample, Schutz-O'Neill engineers will recommend the correct size and type of mill and the most efficient Mill plan for your use. This in no way obligates you. Literature on request.

Some territories are open for Sales Engineers on Schutz-O'Neill products. Write stating qualifications.

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PULVERIZERS · BREAKER MILLS · ROLLER MILLS · BURR MILLS · HAMMER MILLS
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were placed in storage at various temperatures. At periodic intervals samples were withdrawn and submitted for chemical and organoleptic tests.

Comparative results of the stabilized fish versus those that were untreated are as follows:

At temperatures of 100 deg. F. the stabilized fish were edible after two weeks of storage whereas the untreated samples were not.

At 70 to 95 deg. F. the stabilized fish were edible up to nine weeks of storage whereas the untreated samples were inedible after two weeks.

At 40 deg. F. the stabilized fish had a good color, odor and flavor after 269 days of storage whereas the untreated lot developed slight rancidity after 55 days. After 117 days the flesh had darkened and the fish oil had become definitely rancid.

Organoleptic tests after one year revealed the untreated fish to be extremely rancid and inedible because of high rancidity, whereas the stabilized samples were only slightly rancid and quite edible.

First Sugar Refinery Planned For Mexico

THE first of several sugar refineries to be built in Mexico by a group of Mexican business men will be constructed at Xiocotencatl, Tamulipas at a cost of 26,000,000 pesos, according to Lania, a Mexican news service.

The national demand for sugar in Mexico has increased recently with the moving of many United States soft drink companies to Mexico. Among those operating in Mexico during the past three years are Orange Crush, Doctor Pepper, Pepsicola, Delaware Punch, and Mission Orange. During the war much of Mexico's sugar was converted into alcohol, due to the high price of that product.

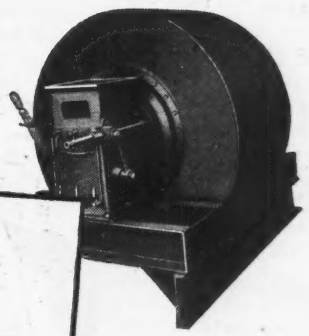
Follow New Procedure In Fixing Standards

SINCE publication of the organizational and procedural material from all Federal agencies, in the September 11 issue of the Federal Register, the Department of Agriculture has been following a new technique in proposing new or revised standards for grades of processed foods. These were formerly issued under the old Agricultural Marketing Service, but are now handled by Production and Marketing Administration of the department.

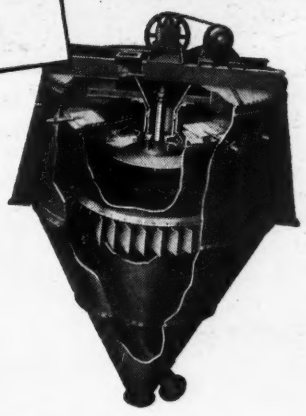
The first step in preparing a pro-

STURTEVANT EQUIPMENT

- Speeds Up Processing
- Cuts Processing Costs
- Assures High Quality Products

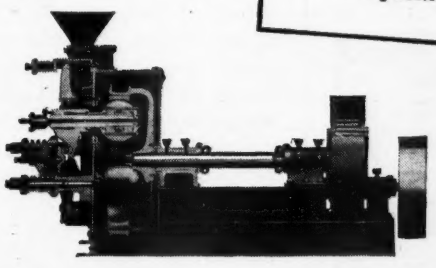


Dry Blender
4-way mixing action provides perfectly blended homogeneous product regardless of varying weights, densities, fineness. Prevents lighter products from floating... nothing remains unmixed. Drum capacities from 1000 pounds to 7500 pounds.



Air Separators
Increases output 25 to 300%; saves on power costs up to 50%. Assures uniform, accurate fineness. Output 40 to 350 mesh ... Capacities from 1 to 50 tons per hour.

Ring Roll Mill
Cannot choke ... quickly pulverizes material ready for the separator. Open-door accessibility permits easy, thorough cleaning. 10 to 200 mesh; crushes hard or soft materials.



With Sturtevant grinders, separators and blenders on the job, you get increased production at lower costs. Linked together in sequence, this equipment guarantees the results you want.

Used individually, each unit does the job faster and easier than other types ... handles a larger variety of work.

Sturtevant equipment is rugged and dependable. Gives long-lived performance with little if any maintenance. We suggest you investigate Sturtevant grinders, separators and blenders for your processes. A wide variety of sizes are available to meet practically every requirement. Write for information today.

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Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

The conveyor, for example, that carries the packaged fish to the freezing plant, is constructed in a series of small wheels that keep the cartons level and moving easily along the line without crowding or speeding that would in any way mar or dent them.

The carrying is activated solely by the pitch of the conveyor, the wheels running free on their bearings. The wheels are so spaced that on the straightaway there is no need of a shear to keep the cartons on the conveyor. When the cartons enter the refrigerator receiving room, they pass aprons that fall back easily into place after the cartons have passed, preventing the escape of cold air. The fine mechanical construction of the all-metal Rapid-Wheel Conveyor is responsible for this flawless part in the process. The Rapid-Wheels are in reality roller bearings that work smoothly and silently—so smoothly, in fact, that a pitch of no more than three inches is sufficient to carry the packaged fillets about 40 feet.

Here's Proof

One of the outstanding pieces of special equipment at the Bay Shore Fish Company is an electric conveyor manufactured by the Rapids-Standard Company of Grand Rapids, Michigan. Essential to speedy loading of the many trucks that come to the fishery daily, Mr. Paul Taylor, fish house manager, believes a new record was established when ten thousand pounds of iced fish were loaded recently in the short space of forty minutes.

MODERN HANDLING METHODS PAY DIVIDENDS

These clippings are from recent issues of FISHING GAZETTE. Additional information may be obtained by writing to the Rapids-Standard Company, Inc.

Storage Pans of frozen fish moving on Rapid-Wheel Gravity Conveyor into 15° below zero hold room from deep freeze room.

Stevedore, Jr. Power Belt Conveyor loads 10,000 pounds of iced fish in forty minutes at the Bay Shore Fishing Co., Cortez, Florida.

OFFICES IN PRINCIPAL CITIES

Manufacturers of

STEEL FORGED CASTERS · TRUCKS · CONVEYORS · POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division—361 Peoples National Bank Bldg., Grand Rapids 2, Michigan

Wide World photo

FLYING MILK

A 40 qt. can of milk, produced on a Pennsylvania dairy farm on the morning of December 10, is delivered in New York by helicopter in time to christen the new Dairymen's League plant at 11 o'clock. In case there is concern over food waste, it should be added that only a quart of the milk was used in the christening.

posed standard, or a proposed revision of an existing standard, is to print it in full in the Federal Register. After a certain time has been allowed for comments from interested parties, a final order may then be printed in the Federal Register, with an indication of effective date of the new regulations. About a month ago two proposed revisions of existing standards for grades of processed foods appeared in the Federal Register. Subsequently a third item appeared, proposing new standards for grades of dates.

Canned sweet potatoes was the subject of the first such announcement which appeared on November 28. December 15 was set as the effective date of the revised grade standards, originally issued August 1, 1934. All persons who desired to submit "written data, views, or arguments for consideration in connection with the proposed revision" were given ten days from the publication of the notice to file these with the hearing clerk of the Department of Agriculture. The final order was scheduled to appear between December 8, deadline for the solicited views, and December 15, the proposed effective date.

Canned dried beans was the subject of the second proposed revision, appearing in the Federal Register of December 3. Interested persons were given 20 days from publica-

Let's look at the Record!

As we start on our 101st year of making valves for industry, we feel that the past record of Powell Valves throughout 100 years of meeting *every* industrial flow control requirement as it has arisen constitutes a definite assurance of future performance.

So, whenever you need valves—for replacements or for new installations—consult Powell. If you have any flow control problems, Powell engineers will be glad to help you solve them.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

Catalogs on request. Kindly state whether you are chiefly interested in Bronze, Iron, Cast Steel, or Corrosion-Resistant Valves.

Fig. 301—125-pound Iron Body Bronze Mounted Globe Valve. Has flanged ends, outside screw stem, bolted flanged yoke, renewable bronze seat and disc holder with renewable composition disc.

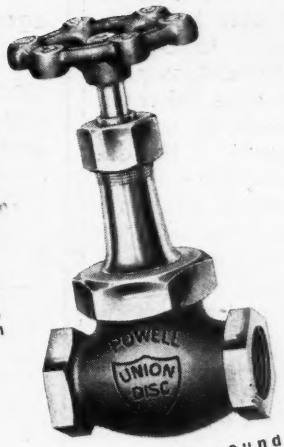

Fig. 150—150-pound Bronze Globe Valve with screwed ends, union bonnet and renewable composition disc.

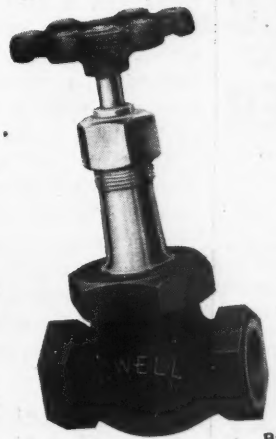

Fig. 190—150-pound Iron Body Bronze Mounted "Irenew" Globe Valve. Has screwed ends, union bonnet and regrindable, renewable wear-resisting "Powellium" nickel-bronze seat and disc.

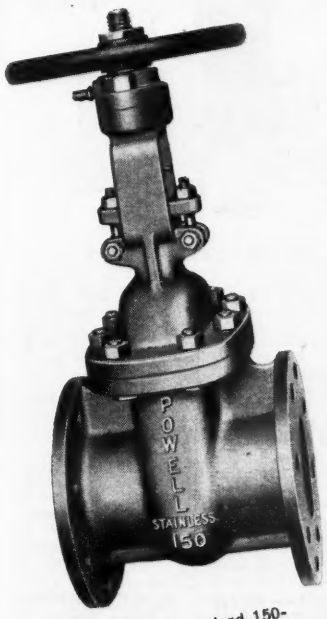

Fig. 2453 G—New Standard 150-pound Stainless Steel Gate Valve with outside screw rising stem, bolted flanged yoke-bonnet and taper wedge solid disc.

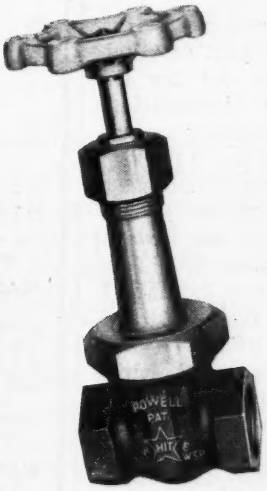

Fig. 375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet, renewable, wear-resisting "Powellium" nickel-bronze disc.

Fig. 2429—150-pound Stainless Steel O. S. & Y. Globe Valve. Has flanged ends and outside screw stem.

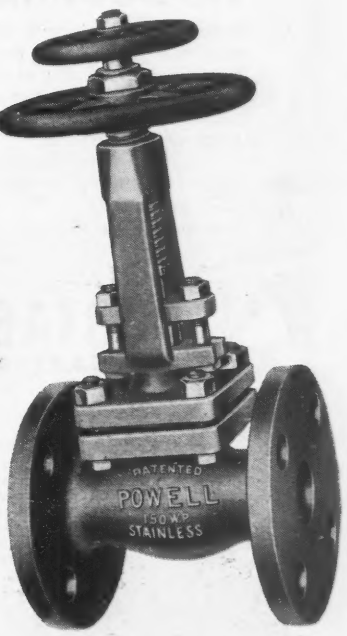

Fig. 1979 S. W.—150-pound Stainless Steel Globe Valve. Has flanged ends, outside screw stem and bolted flanged yoke. Equipped with Powell patented seat wiping arrangement.

POWELL VALVES

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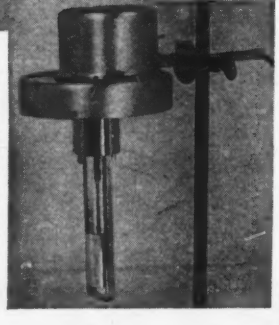
SYNCHRO-LECTRIC
VISCOSIMETER

Making Viscosity tests at point of process is a snap with the Brookfield Viscosimeter. All you need is a convenient electrical outlet and you're set to take readings of high accuracy in 30 seconds.

Readings given directly in centipoises over wide ranges. Temperatures up to 600° F. No adjustments necessary. Requires no technical skill.

PORTABLE!
USE IN PLANT OR LAB

Same instrument can be used in both plant and lab Use as a portable instrument shown at left Operates on 60 cycle 110 volt current



When instrument is needed for stationary use only it may be mounted on a rod clamp as shown at right. Handles are interchangeable.

BROOKFIELD
ENGINEERING LABORATORIES
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tion of that notice to file their comments. This deadline was December 23 and the effective date of the revised standards was to be January 2, 1947, superseding the standards that were issued January 10, 1934.

Dates was the subject of proposed new U. S. grade standards. These appeared in the Federal Register for December 10. Deadline for submission of comments was the 20th day after publication (December 30) and the effective date of the new standards was to be January 2, 1947.

In all three cases, discussion with the industry had been proceeding for some considerable time. Publication of those proposed standards in the Federal Register has been carried out primarily to comply with the new department regulations. In a future case, where a proposed new standard or revised standard is first issued by the department, a considerably longer period would be normal (a minimum of 30 days is legally required).

Prompt reading of the Federal Register is assumed by the department officials. Complete understanding of the proposed standards and comprehensive comments, promptly returned, will be necessary for most effective operation of this revised technic.

Egg Product Plants Get New Instructions

PURSUANT to the authority contained in the Department of Agriculture appropriation act for the present fiscal year, instructions governing plants operating as official plants processing and a packaging egg products were proposed in November and subsequently confirmed by an order in the Federal Register for November 30. They were to become effective January 1.

The instructions include definitions and an outline of the requirements for those plants at which continuous inspection is to be inaugurated. Specifications for the raw materials and the premises, its facilities, equipment, and operations are given in detail.

Marine Institute Will Study Fish Industry

THE University of Texas, Austin, Tex., has appropriated about $63,000 for an Institute of Marine Science to be located on Mustang Island in Corpus Christi Bay. The Marine Institute will apply scientific research to the problems of the state's fishing industry. It will

New! 20-Mill Plastic

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PLASTIC APRONS!

Will Not Crack or Peel

POSITIVE PROTECTION against WATER, OIL, ACIDS, ALKALIES

NO LAUNDERING *Just wipe off with a damp cloth. A tremendous cost saver.*

20 MILL PLASTIC
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Cost only about **1** *cent a day*

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30 x 36.. 7.53 per doz.
36 x 40.. 7.96 per doz.
36 x 44.. 8.85 per doz.
Full Length Sleeves $6.00 per doz. pair

BLACK or WHITE— 8 Mill Plastic
27 x 36..$ 9.00 per doz.
30 x 36.. 9.75 per doz.
36 x 40.. 11.15 per doz.
36 x 44.. 13.65 per doz.
Full Length Sleeves $10.65 per doz. pair
Leggings, Hip Length $13.10 per doz. pair

MAROON — Heavy Double Coated Neoprene
27 x 36..$12.90 per doz.
30 x 36.. 14.00 per doz.
36 x 40.. 18.33 per doz.
36 x 44.. 20.50 per doz.
Full Length Sleeves $12.90 per doz. pair
Leggings, Hip Length $23.50 per doz. pair

BLACK— 12 Mill Plastic
27 x 36..$10.25 per doz.
30 x 36.. 11.15 per doz.
36 x 40.. 14.25 per doz.
36 x 44.. 15.80 per doz.

BLACK—Heavy Double Coated Neoprene
27 x 36..$12.90 per doz.
30 x 36.. 14.00 per doz.
36 x 40.. 18.33 per doz.
36 x 44.. 20.50 per doz.
Full Length Sleeves $12.90 per doz. pair
Leggings, Hip Length $23.50 per doz. pair

BLACK or WHITE— Extra Heavy 20 Mill Plastic
27 x 36..$14.20 per doz.
30 x 36.. 15.50 per doz.
30 x 40.. 20.15 per doz.
36 x 45.. 22.60 per doz.
Full Length Sleeves $14.25 per doz. pair
Leggings, Hip Length $25.75 per doz. pair

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Dryer Temperatures CONTROLLED by Continuous balance
with LABORATORY ACCURACY
Now, They're Cooking with Electroniks
BROWN Electronik POTENTIOMETERS In the Food Industry

See ElectroniKs in Action at the National Canning Show—Booth 43

The use of Brown ElectroniK Potentiometers for measurement and control of process temperatures has become a virtual trend in the Food Industry. The greater accuracy, sensitivity and speed of response of these instruments makes possible uniformly better quality and greater output.

The complete ElectroniK Family along with a host of other Brown Instruments and Minneapolis-Honeywell Control Systems for the Canning Industry will be on display, Booth 43, at the National Canning Show in Atlantic City.

Brown engineers in attendance will welcome the opportunity to discuss your specific control problems.

If you can't attend the show, send for Catalog 15-4R describing the Brown ElectroniK Potentiometer.

THE BROWN INSTRUMENT COMPANY, a division of Minneapolis-Honeywell Regulator Company, 4502 Wayne Avenue, Philadelphia 44, Pa. Offices in all principal cities.

TORONTO, CANADA LONDON, ENGLAND STOCKHOLM, SWEDEN AMSTERDAM, HOLLAND

BROWN Electronik POTENTIOMETERS

A Trend in the Food Industry

What's your

PACKAGING PROBLEM?

If you want a simple . . . dependable . . . economical solution for your packaging problems, check with Union Special. For more than fifty years, Union Special has worked in close cooperation with makers of bags, conveyors, and bag filling and weighing equipment to produce specially designed bag closing machines that meet the needs of industry. Union Special equipment includes machines for closing bags of all types and sizes. Experience gained in handling bag closing problems in many different fields is your assurance of complete satisfaction. Ask for recommendations on your particular problems. Literature on request. UNION SPECIAL MACHINE CO., 450 N. Franklin St., Chicago, Ill.

Union Special

Bag Closing Machines

study gulf marine life, causes of decreasing coast marine life, better methods of fish, shrimp and oyster propagation and culture, and will investigate the possibilities of more scientific methods of commercial fishing.

The Marine Institute will provide facilities for research into the chemical, medicinal and mineral products derived from ocean plants and animals and will serve as a laboratory and classroom for students of marine biology in all schools and colleges of Texas.

Protein From Molasses Developed In Jamaica

AFTER two years' development work, the Jamaica factory, sponsored by the British Colonial Office to produce a cheap protein concentrate from molasses, is due to come into full operation immediately. Difficulties arising from the contamination of the yeast with iron from the equipment, and insufficient air supply to the fermenter, have only recently been overcome.

Besides lining the plant with an inert substance and installing more air compressors to solve the urgent production problems, it was found possible to simplify the process, and the plant should now be capable of an output of 12 to 15 tons of food yeast a day. Small quantities of food yeast have in fact been produced for some months, but these have been shipped half-way across the world to Malaya, where they have helped to relieve an acute food shortage by admixture with bread, soups and gravies to fortify the protein content of the diet.

Earlier estimates of cost have been falsified by the alcohol industry's demand for molasses, which is the basic raw material of the food yeast process. Molasses has quadrupled in price since the Colonial Office drew up its estimates. Nevertheless, food yeast will still be a cheap form of protein, and should not cost more than a shilling a pound ex factory in bulk packages.

The food yeast produced at the Frome, Jamaica, factory by a fermentation process using a highly efficient strain of *Torulopsis utilis* is a finely ground, pale cream powder with a flavor which might be described as "meaty". Its flavor, whether palatable or merely unobjectionable, is not of primary importance, for the food yeast is intended as an additive to prepared foods, valuable for its protein and vitamin B complex content. It is essentially a diet supplement for

Continuous Sifting with BAR-NUN Economy

GUMP ENGINEERED

A Bar-Nun Sifter User writes:

"We are well pleased with our new Sifter—besides doing all the work we ask of it—about 6,000 pounds per hour—I believe the maintenance cost will be far less than anything used for an equal purpose for a long time to come."

Statements of satisfaction such as the above usually follow the installation of a Bar-Nun Rotary Sifter. Sifting efficiency reaches a new high degree of perfection in these machines. Whatever your sifting requirements may be, you will usually find a standard Bar-Nun Sifter can do the job economically.

Let us work with you to solve your sifting problem!

B. F. Gump Co.

Established 1872

454 South Clinton Street • Chicago 7, Illinois

MAKERS OF: *Equipment for Grinding, Sifting, Mixing, Feeding, Packing and Weighing of Dry Food Products.*

Take a WALWORTH No. 225P Bronze Valve Apart...

COMPARE IT PIECE BY PIECE

It will pay you to look inside the Walworth No. 225P. Compare the improved design, construction and convenience features shown in the "exploded" view. Notice the husky bronze body, the removable seat and disc, the oversize stem, all assuring maximum protection against wear and leakage.

Further, No. 225P is the TOUGHEST bronze valve your money can buy. The stainless steel, non-corrosive seats and discs are heat treated to a hardness of 500 Brinell — hard enough to scratch glass and crush nails. For this reason, the valve can be closed on sand, slag, scale and similar flotage without injury to the seating surfaces, and "wire drawing" is practically eliminated. Thus years of tight, positive shut-off are assured.

Available in both globe and angle types (angle type: No. 227P) in sizes ¼" to 2", this quality valve is recommended for 350 lbs. W.S.P. at 550 F, and 1000 lbs. non-shock service on cold water, oil, gas or air.

For full data on this long-life, economical Walworth Bronze Valve, see your local Walworth distributor, or write for Circular 82.

WALWORTH

valves and fittings

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Improved production of fine and ultra-fine powders thru

MECHANICAL PULVERIZATION

—this new Book contains everything you want to know about pulverizing. Send for your copy today

This valuable book—soon off the press—tells you how to produce fine and ultra-fine powders; how to test the value of fine and ultra-fine grinding right in your own laboratory or pilot plant before starting full production schedules; how to control particle size, blending and dispersing, accurately; how to select the proper mechanical pulverizer for your needs; as well as many other important facts about pulverizing.

Send for this new book today and learn why it is decidedly to your advantage to use a MIKRO-PULVERIZER or one of the new MIKRO-ATOMIZERS in your pulverizing operation.

PULVERIZING MACHINERY COMPANY
97 CHATHAM ROAD • SUMMIT, N. J.
NOW . . . 2 TYPES TO MEET MOST PULVERIZING NEEDS

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Please send me a copy of your new Book when it is ready.
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Mail this coupon with your company letterhead

communities that not only lack purchasing power but are short on normal sources of protein such as meat, fish, eggs and vegetables. Molasses is not an indispensable medium for fermentation; any suitable carbo-hydrate material—often a waste product of the local staple crop—will do, as long as it can conveniently be transported to a central factory, and provided there are a good water supply and facilities for disposing of the effluent.

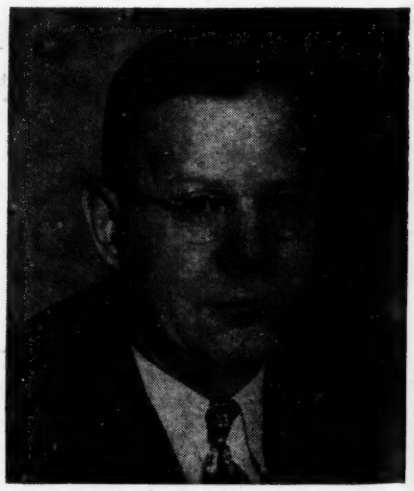
General Interest

Most countries with a protein problem are watching the Jamaica experiment with keen interest. South Africa has already built a plant, although its operation is understood to be waiting on Jamaican experience, and there have been inquiries about the process from Czechoslovakia, Palestine, Brazil, Mexico and India.

Butter Makers Report On Research Programs

CONTINUATION of its quality improvement program with increased support to the work of the cream quality committee by individual members as well as by adequate funds for farmer-producer educational work, was approved by the American Butter Institute at its annual meeting in Chicago, Nov. 25 and 26.

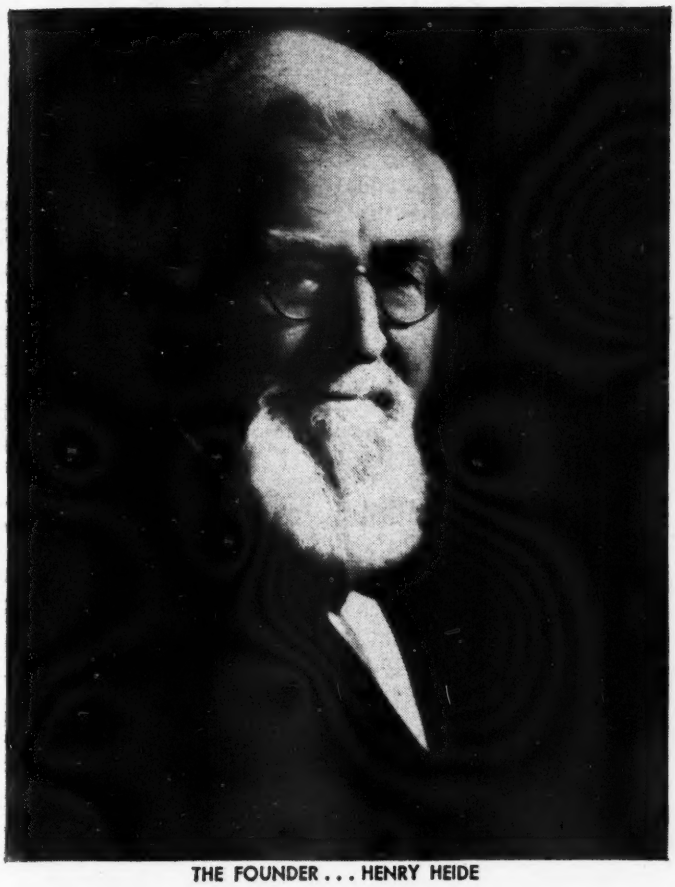
In carrying out this program, the butter making companies are to continue their cooperative work with state colleges in research projects and with governmental regulatory agencies, and to accept full responsibility for the sanitary conditions of their processing plants.



PLANS RESEARCH

E. A. Meyer was recently placed in charge of all USDA programs designed to carry out the Research and Marketing Act.

A Blind Horse Was Bought in '69



THE FOUNDER . . . HENRY HEIDE

. . . and Henry Heide started his climb to candy fame

BACK in 1869, Henry Heide decided to make the change from a candy jobber to a candy manufacturer. He rented a basement and bought a horse for his deliveries . . . a horse that turned out to be blind and constantly bumped into elevated pillars . . . but Henry Heide had the ability to overcome obstacles.

At that time, low-cost candies were sometimes questionable, and Heide's promise and faithful delivery of "quality candies" made a hit with America's sweet tooth. Today, a great variety of candies bear the famous Heide trade-mark . . . a growth largely achieved in the lifetime of its energetic founder.

The history of Heide is an example of both individual and company initiative . . . of the business progress and growth that has helped to make America great.

Heide

HOW HEIDE USES RIEGEL FUNCTIONAL PAPERS

Riegel's Wet-Waxed Sulphite has long been used by Henry Heide, Inc. as a die-cut, machine-formed liner for bulk candy boxes, and Riegel experts have worked constantly to produce improved methods of candy packaging. This was particularly important during the war when Heide devoted a large part of its production to special types of emergency rations.

Riegel Papers

185

FOR FUNCTIONAL PACKAGING

RIEGEL PAPER CORPORATION • 342 MADISON AVE. • NEW YORK 17, N. Y.

WHAT DO YOU *really* KNOW ABOUT VITAMIN D?

HAVE YOU considered *all* the sales factors that can result from the incorporation of vitamin D in food products?

For example, do you know:

That vitamin D, nutritionally-valuable as it is to growing children and some adults, can be found in appreciable amounts only in a *few* common foods?

And that the potential market of vitamin D consumers is growing all the time?

Yes, these are sales factors to be considered. Because, for some food products, vitamin D incorporation can be very important in determining consumer preference.

CONSIDER THE MARKET

Children under nine years of age—most important group of vitamin D users—are increasing in numbers. By 1950, it is estimated this will be the largest 10-year-segment group in the population—some 27,000,000. They'll *all* need vitamin D rich foods.

And here's a further influence on sales. The modern housewife, particularly one with children, is keenly aware of the nutritional importance of vitamin D. Surveys show that women know more about D than any other vitamin, know that it can easily be incorporated in some foods.

The market is here. This may be your opportunity to take advantage of a unique situation for product improvement and competitive leadership. If so, write *now* for full information regarding Vitamin D (A.R.P.I. Process) and its possible incorporation in your product.

General Mills, Inc.

Special Commodities Division

MINNEAPOLIS 15, MINN. 80 BROAD STREET NEW YORK 4, N.Y.

G. W. Shadwick, Beatrice Foods Co., Chairman of the Institute Research Committee, reported that test runs with the Roth butter-making machine, obtained from Germany, show that improvements in design and construction are needed to make it practical and that the Alpha machine, also obtained from Germany, is yet to be studied.

Equipment Standards

Progress report was made on the cooperative work under way with the Dairy Industry Committee, U. S. Public Health Service and International Association of Milk Sanitarians on development of sanitary standards for equipment, materials and methods. A.A.A. standards have been established for fittings, pipe lines, thermometers, and milk storage tanks. Standards are being formulated for weigh cans, milk transportation tanks, milking machines, milk pails and strainers, homogenizers and gages for storage holding-tanks.

RAW MATERIALS

Philippines Cancel Copra Buying Pact

EARLY in December Secretary of Agriculture Anderson announced that the agreement with the Philippine government for purchase of copra had been cancelled, as requested by the latter. The agreement, announced early in August, had included specific price levels which would permit importation of Philippine copra and coconut into the United States under then existing price ceilings. "Removal of price and other controls in this country has changed the basic situation materially."

Now that the agreement has been cancelled, the Philippine government will assume the direct responsibility to further the equitable distribution of Philippine copra and coconut oil through the procedures of the International Emergency Food Council.

Infestation Imperils Georgia Pepper Areas

GEORGIA'S $1,000,000 pepper industry has been imperiled as a result of a chance load of bell peppers brought to a mid-state cannery from Tampa, Fla. State Entomologist C. H. Alden said that the load of peppers has caused infestation by the destructive pepper weevil and the infested areas are to be quarantined.

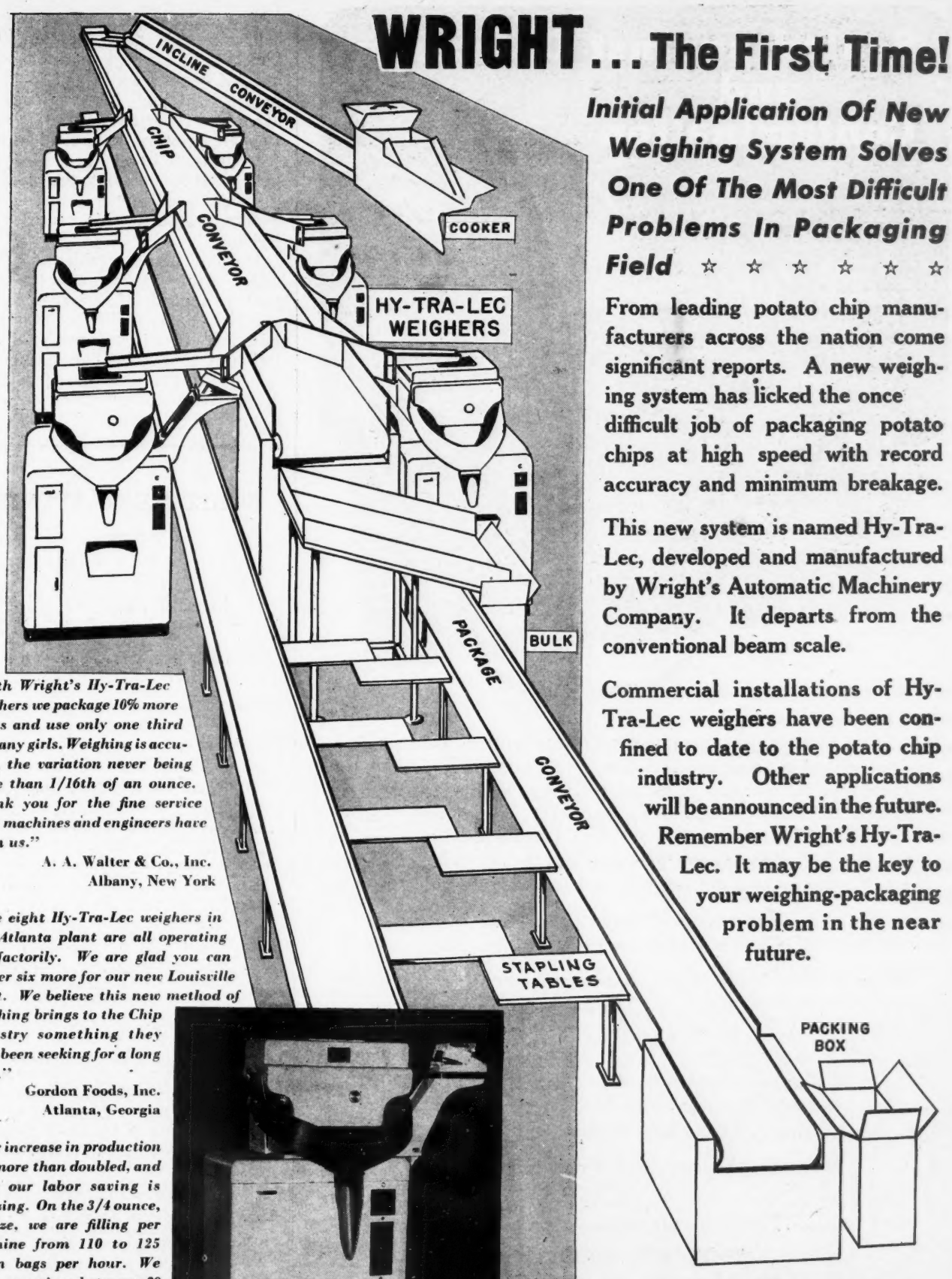
WRIGHT...The First Time!

Initial Application Of New Weighing System Solves One Of The Most Difficult Problems In Packaging Field ☆ ☆ ☆ ☆ ☆ ☆

From leading potato chip manufacturers across the nation come significant reports. A new weighing system has licked the once difficult job of packaging potato chips at high speed with record accuracy and minimum breakage.

This new system is named Hy-Tra-Lec, developed and manufactured by Wright's Automatic Machinery Company. It departs from the conventional beam scale.

Commercial installations of Hy-Tra-Lec weighers have been confined to date to the potato chip industry. Other applications will be announced in the future. Remember Wright's Hy-Tra-Lec. It may be the key to your weighing-packaging problem in the near future.



"With Wright's Hy-Tra-Lec weighers we package 10% more items and use only one third as many girls. Weighing is accurate, the variation never being more than 1/16th of an ounce. Thank you for the fine service your machines and engineers have given us."

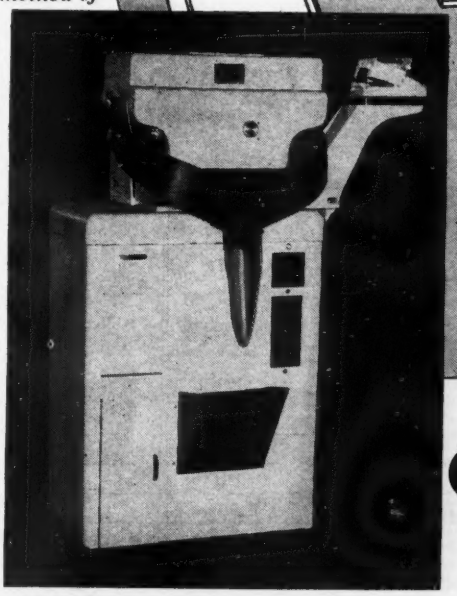
A. A. Walter & Co., Inc.
Albany, New York

"The eight Hy-Tra-Lec weighers in our Atlanta plant are all operating satisfactorily. We are glad you can deliver six more for our new Louisville plant. We believe this new method of weighing brings to the Chip Industry something they have been seeking for a long time."

Gordon Foods, Inc.
Atlanta, Georgia

"Our increase in production has more than doubled, and truly our labor saving is amazing. On the 3/4 ounce, 5c size, we are filling per machine from 110 to 125 dozen bags per hour. We are averaging between 80 and 85 dozen packages of 1 3/4 ounce, 10c size, per hour per machine. Breakage is practically nil."

Paradise Foods Co.
Detroit, Michigan



WRIGHT'S Automatic Machinery Company

333 Calvin Street Durham, North Carolina

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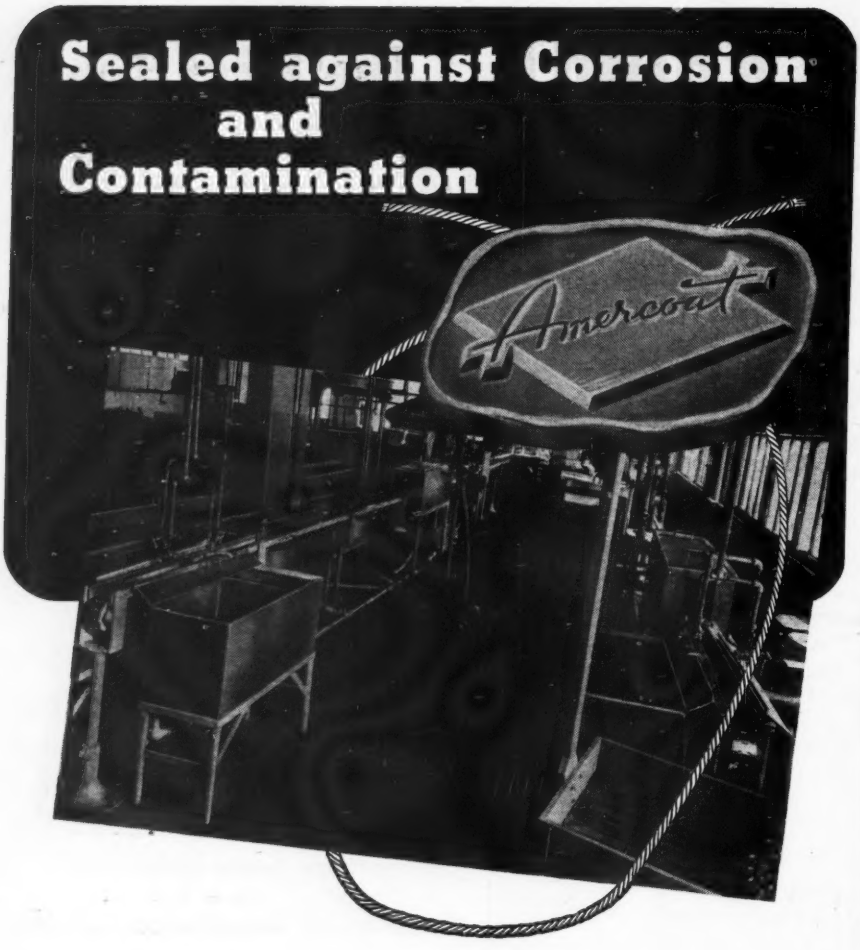
IN AUTOMATIC PACKAGING MACHINES.

Sealed against Corrosion and Contamination



One of the largest olive packing plants in the United States experienced continuous losses due to brine corrosion in spite of constant maintenance of equipment. Even corrosion resistant alloy steel was not immune to attack. This user reports that AMERCOAT-treated equipment was unaffected by brine and that they had positive corrosion control for the first time...one of many examples of AMERCOAT'S usefulness in food industries.

Amazing Plastic Coating Gives Positive Protection

Throughout the food industry, Amercoat is saving equipment, materials, time and money for users, because it is:

— completely resistant to practically every corrosive action encountered in the food industry;

—unaffected by caustic sterilizing agents...equals glass in resistance to harboring bacteria, mold and fungi;

— non-toxic...has no taste transfer.

Get Amercoat Protection

Amercoat can be easily applied with brush or spray to concrete, wood or steel. For full details write us about your needs today.

IMMEDIATE DELIVERY

Amercoat

AMERCOAT DIVISION
American Pipe & Construction Company
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P. O. Box 3428, Terminal Annex • Los Angeles 54, Calif.

The first reported area was in a four-acre field near Wayside, Ga., but now it has spread in a wide area of Jones County and in parts of Baldwin and Jasper Counties. Mr. Alden reported that the Georgia Pepper Growers' Association was fearful that rapid spread of the pest might wipe out the pepper-growing and pepper canning industry, which now is centered in Griffin.

It has been established, Mr. Alden said, that a cannery imported a load of weevil-infested bell peppers from Hillsboro County, Fla., last June, in unintentional violation of quarantine banning movement of peppers or pepper plants from Hillsboro, De Soto or Manatee Counties in Florida.

SCHEDULE OF EVENTS

January

12-17—National Food Brokers Association, Atlantic City, N. J.
13-14—Refrigeration Research Foundation, annual meeting, Hotel Statler, Cleveland, Ohio.
16-17—National Pickle Packers Association, annual meeting, Palmer House, Chicago.
19—Canning Machinery and Supplies Association, 40th meeting and exhibit, Auditorium, Atlantic City, N. J.
19-24—National Canners Association, 40th annual convention, Atlantic City, N. J.
20-23—National-American Wholesale Grocers Association, annual convention, Atlantic City, N. J.
20-Feb. 1—Ice Cream Manufacturers Short Course, Penn State College, State College, Pa.
27-29—National Potato Chip Institute, conference and annual election, Netherlands Plaza Hotel, Cincinnati.
27-31—American Society of Heating and Ventilating Engineers, 54th annual meeting and 7th international exposition, Lakeside Hall, Cleveland, Ohio.
29-31—National Dairy Council, annual meeting and winter conference, Hotel Traymore, Atlantic City, N. J.
29-31—Indiana Canners and Fieldmen's School, 21st annual session, Purdue University, Lafayette, Ind.

February

2- 4—American Poultry Industries, fact finding conference, Municipal Auditorium, Kansas City, Mo.
10-11—Tennessee-Kentucky Canners Association, annual meeting, Andrew Jackson Hotel, Nashville, Tenn.
11-13—University of Maryland, Tri-State Packers Association, canners' and fieldmen's school, College Park, Md.
18-20—Michigan State College, technical school for pickle and kraut packers, East Lansing, Mich.
23-26—Associated Retail Bakers of America, national convention, Pennsylvania Hotel, New York, N. Y.

March

3- 8—State College of Washington, Institute of Dairying, Pullman, Wash.
10-13—American Society of Bakery Engineers, 23rd annual meeting, Edgewater Beach Hotel, Chicago.
19-21—National Association of Frozen Food Packers, annual convention and exposition, Public Auditorium, San Francisco.
31-Apr. 4—Frozen Food Institute, annual convention, Copley - Plaza Hotel, Boston, Mass.

Changes in Food Supplies

(Indicators)

Materials

Apple production, on November 1, was estimated at 121,494,000 bu., as compared with total 1945 production of 68,042,000 bu.

Pear production, estimated at 34,710,000 bu., November 1, was a little above the 34,011,000 bu. produced last year.

Green lima beans for processing are estimated at 21 percent above the record high 1945 production of 34,820 tons. The 42,020 tons this year surpass the ten-year average by 52 percent.

Lard production in October stood at 74,749,000 lb., almost five times the September output of 15,202,000 lb.

Cucumbers for pickles reached a record high in 1946, preliminary estimates being 9,879,000 bu., which exceeds 1945 production by 24 percent, and the ten-year average by 52 percent. This year's crop is 19 percent higher than the previous record of 8,307,000 bu., produced in 1942.

Production

Creamery butter production in October showed a less than normal seasonal decline, the 97,135,000 lb. being only 7 percent under September. Last year's September-October decline was 12 percent and the five year average was 10 percent. While the output was 11 percent higher than in October, 1945, it was 19 percent lower than the five year average for the month.

American cheese production, estimated at 60,690,000 lb., was up 3 percent from October, 1945, and 7 percent higher than the five year October average. Although production was 14 percent lower than the September output, it was second only to the all-time record for the month, set in 1941.

Flour production in November, according to the Northwestern Miller, totaled 16,633,900 sacks in mills representing 71 percent of the total. This was a decline of 414,105 sacks from October, but was higher than the 15,607,131 sacks produced in November, 1945.

Durum production was 933,833 sacks, in November, an increase of 41,661 sacks over October, but 144,980 sacks under November, 1945.

Ice cream production, in October, is estimated at 56,375,000 gal., which was much less than the usual seasonal decline. Output was only 11 percent under September and was 17 percent above October, 1945. Compared with the five-year October average, production was up 84 percent.

Liquid egg production, estimated at 12,715,000 lb., compares with 8,645,000 lb. produced in October, 1945. Of the total October output, 8,907,000 lb. were used for drying, 2,205,000 lb. were frozen and 1,603,000 were used for immediate consumption.

Canned fish estimates for the year beginning last July 1, are now 645,000,000 lb., a drop from the 698,000,000 lb. estimated previously. This downward revision is due largely to the low salmon and pilchard packs. These estimates do not include 26,000,000 lb. of squid.

The corn pack for 1946, is estimated by the National Canners Association to be 30,951,000 cases, basis 24/2's. This compares with 28,236,900 cases produced in 1945.

The pimiento pack is not expected to top 15,000 tons, which is considerably below earlier estimates that ran as high as 22,000 tons. Georgia's pack will be between 12,000 and 14,000 tons and California should reach 1,000 tons.

Indexes

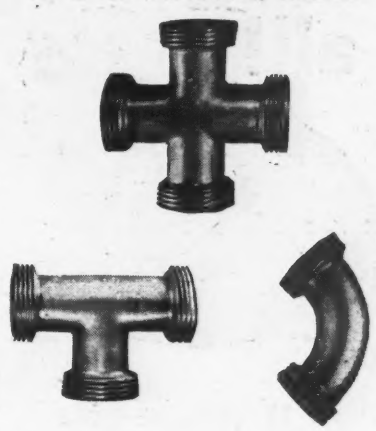
The commodity price index on food, compiled by the New York Journal of Commerce, stood at 184.6 for the week ending December 21. This compares with 185.9 for the previous week, 191.7 a month ago, and 112.5 for December, 1945.

Business Week's index of business activity was 185.0 for the week ending December 14, which compares with 178.4 the previous week, 188.9 a month ago, and 171.7 a year ago.

CONSTRUCTION NEWS

	Pending (thousands)	Awarded December (thousands)	Total Awarded 1946 (thousands)[1]
Bakery	$3,620	.....	$4,808
Beverages	325	$870	25,016
Canning and Preserving	400	125	6,323
Cold Storage	1,128	169	9,083
Confectionery	115	.....	2,525
Grain Mill Products	1,111	266	15,180
Ice, Manufactured	.....	.....	1,170
Meats and Meat Products	1,295	374	4,127
Milk Products	1,310	210	17,014
Miscellaneous	2,247	14,764	40,890
	$11,551	$16,778	$126,136

SANITARY STAINLESS STEEL FITTINGS



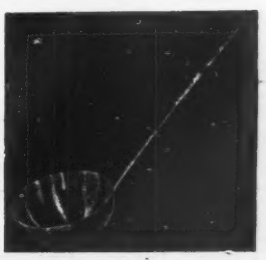
Eliminate unsanitary lines and bacteria pockets in your processing lines—install the new Sanitary Fittings and Tubing that gives you a smooth inside — Leak tight joints. Faster, easier installation and maintenance — longer fitting life — no frequent replacements.

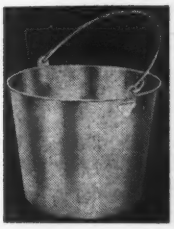
Use Super Speed Tools for Erecting Sanitary Lines

Fittings Shipped From Stock

DIPPERS

72 oz. with 17" hooked handle. Also some one, two and four-quart FLAT dippers.





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NAILS • WIRE • BOLTS
ALUMINUM

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BE SAFE, BE SURE

with Air Float Stoning!

• Dangerous, damaging contaminations have no business being fed into that expensive machinery of yours—or into your finished product! To eliminate this costly headache, we have developed a revolutionary, new type stoner—low in first cost, in operation. Removes NON-MAGNETIC as well as magnetic metals, stones, glass, and other hard, dangerous contaminations from wheat, cereals, beans, and other dry food products with BETTER THAN 99% EFFICIENCY! CAPACITY UP TO 16 TONS PER HOUR, with an operating cost of only ¼ of one H.P. per ton hour AT FULL CAPACITY! *Write for Bulletin FI-147 or FI.*

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What Washington Thinks

By R. S. McBRIDE, Washington, D. C.

TO PRIVATE INDUSTRY—Quality standards for apple juice were developed by Michigan State College investigators, according to a most complimentary comment in Washington. But the industry making apple juice is now so well informed that the Michigan authorities have gone back to other research activities and "left to private industry" the job of making and marketing apple juice.

JUST GOOD BUSINESS—The continuing of the practice of vitamin enrichment of bread and rolls is "just good business". This is the conclusion of the Department of Agriculture, which forecasts a continuance of the war standards for enriched baked goods even though the mandatory rules fixed by War Food Administration are no longer in force. Incidentally, in summarizing the war-time practice, the department is very complimentary of the effective voluntary cooperation of the industry. Willful violations of rules were, it appears, few and unimportant as affecting the public health.

CONTROLLED MONOPOLY—The Republican Congress will try to rewrite labor laws. One of the most conservative, hence most likely, proposals offers some control over monopoly labor groups similar to the control of monopoly in industry. The point would be that this could prevent general public hardship cases by substituting federal intervention only where essential. It is even possible that some labor leaders might accept this curb of their own authority as much less threatening than other legislation, which certainly is going to be advocated and debated during the next few months.

"HARD TIMES" BUYING—When times get hard the housewife has less market basket money, but she is not likely to buy much less food. She simply spreads the money a bit by buying much more food of low unit cost. Thus the highly processed and high unit-cost foods are passed by. No one yet knows the economic consequence of the John L. Lewis labor upset. But if it should result in an economic tailspin, we can safely forecast that this change in buying habits of the housewife will redistribute the money in the food budget, favoring less-processed and cutting down on more-processed items.

BRISTLES FROM MILK—One of the largest distributors of brushes has begun commercial manufacture of synthetic bristles made from casein by a process developed at the Eastern Regional Research Laboratory. The new artificial fiber is made by extrusion to any desired length and diameter to suit the brush use intended. Thus the government and the American Dry Milk Institute both will have a slightly smaller task on their hands as they undertake to find new commercial uses for skimmed milk. But both those propaganda groups can be expected also to push other new by-product development for the dairy industry. Of course the Institute will talk only of "dry milk solids" as it does not believe that there is any such thing as "skim" milk. But whatever the name, the industry will welcome a profit from any new by-product.

TECHNOLOGY NEEDED—Forecasting supply and price trends in the citrus industry has led certain Department of Agriculture executives to a novel (for them) conclusion. They now recognize the importance of better technology in cutting cost. This is the way they reach that sound conclusion: There is an immense crop of citrus fruit. If there were enough containers the pack would be tremendous of both juice and slices. The carry-over is substantial. A price break was first forecast because for the first time citrus packers would be confronted with a buyers' market. All this reasoning may go by the board because of the shortage of con-

CHANGE OF ADDRESS

DIRECTOR OF CIRCULATION, FOOD INDUSTRIES
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New Company Connection .....

New Title or Position .....

tainers. But the conclusion still remains a sound one, officials admit. That conclusion is: He who packs at the lowest cost, producing the best quality, is best able to meet a highly competitive market situation. Food technologists will not be surprised, unless it is by the fact that government economists have just discovered this.

BACK-WAGE SUITS—Claimed deficiencies in wages paid in the past may now be collected by court action of employees a very long time after the deficiency has occurred. That is resulting in very grave threats to certain companies, which in good faith, thought that they had settled wages and later find that some technicality can be used as a basis for a huge additional demand with penalties. To correct that evil Congress has several times considered the Gwynne Bill, which proposes that any suits claiming deficiencies must be filed within one or two years. Members of Congress should be urged by food technologists to put that legislation on the statute books as a part of the labor law reform that will be undertaken early in the 80th Congress. Unless some such law is enacted a company of moderate resources may be made bankrupt despite its desire to deal fairly with its employees.

RESEARCH CONTRACTS—Uncle Sam has been trying to get industrial and institutional research groups to do some of his research under contract. Perhaps the most serious obstacle in getting agreements of this kind between thoughtful research directors and the government, is the difficulty of defining the ownership of patent rights that may result. Some research directors, who otherwise would have welcomed government work, have found it impractical to make such arrangements lest all of the activities in their institutions be thrown under the cloud of government interference in private exploitation. This is a big difficulty, which no one appears yet to have solved in Washington.

FOR EGG USERS—Big food plants using large quantities of fresh eggs will be interested in the new candling school program currently under way with Department of Agriculture guidance. Over 30 such schools will be conducted jointly by Inspection and Grading Service and the state-college extension services. Any important egg user will be interested in knowing that the graduates of these grading schools should be competent to handle shell eggs in accordance with the latest definitions in the standards which are legally binding in many states and for inter-state trade. As a result of the schooling a more dependable grading of eggs generally may be expected.

Monsanto Sodium Benzoate, U. S. P. flakes often preferred

Based on their own tests, many food processors and bottlers have discovered the greater value of Monsanto Sodium Benzoate, U.S.P., in flake form — have seen how it flows more freely and evenly than powder, does not lump or ball, creates less dust, and is therefore less objectionable to operators. This has also helped them achieve easier handling and blending for uniform results.

Both flake and powder form are manufactured to equally high standards of product purity.

Try both and see why flakes are preferable. Samples will be sent on request. Contact the nearest Monsanto District office, or write: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri . . . District Offices: New York, Chicago, Cleveland, Boston, Detroit, Charlotte, Cincinnati, Birmingham, Los Angeles, San Francisco, Seattle, Montreal, Toronto.

MONSANTO CHEMICALS

To avoid damage from Oxidation . . .

protect with NITROGEN

LINDE Nitrogen provides an ideal means of protection against oxidation and corrosion by air. For packaging dehydrated foods; for deaerating, processing, storing and packaging fats and oils of all kinds; or for providing an inert atmosphere, free of impurities, for the complete protection of practically any material susceptible to oxidation, use LINDE Nitrogen.

LINDE Nitrogen is 99.7% pure, but is also available bone dry and at higher purity for special applications. It is supplied as a compressed gas in cylinders containing 224 cu. ft. each, or in bulk in tank-truck and tank-car lots as a liquid which is converted into gaseous nitrogen as required. LINDE Nitrogen in bulk offers remarkable savings in cost and eliminates cylinder handling.

Write or call the Linde office nearest you.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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The words "Linde" and "Prest-O-Lite" are registered trade-marks.

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Milwaukee, Wis.
Minneapolis, Minn.
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MEN • JOBS • COMPANIES

INDUSTRY

Birtcher Bros. and Dorr, Inc., Los Angeles, has opened a new plant in Southern California to produce fresh frozen orange juice. Ed Dorr is president and general manager of the operation which contains a testing laboratory and test kitchen for experiments in juice processing.

The Bridgford Co. has adopted continuous inspection of the preparation, processing and freezing operations by Federal Inspectors of the U. S. Department of Agriculture, at its Santa Rosa, Calif. plant.

Buhler Mill & Elevator Co., Kansas City, Mo., has purchased the outstanding common stock of the Enns Milling Co., Inman, Kan., thereby acquiring a 1,000-bag mill and 150,000 bu. grain storage. Enns Milling Co. will continue to operate independently under its own name.

Centennial Flouring Mills, Seattle, will consolidate with the Montana Flour Mill Co., Great Falls, Mont., according to H. Ray DeChenne, secretary-treasurer of the Seattle company. The Montana firm owns five mills in Montana and one in Cleveland, Ohio. Its subsidiary, Montana Elevator Co., has elevators and warehouses throughout the wheat region of Montana. Centennial operates several mills as well as 87 grain elevators and warehouses with a total capacity of 4,350,000 bushels in Oregon and Washington.

Jack and Jill Jam and Jelly, Inc., Bloomingdale, Ill., is a newly organized company that will begin to manufacture preserves, jellies, sauces and condiments, the first of the year. L. O. Ehrlich is head of the company. He formerly was production manager for Martin Food Products, Inc., Chicago.

National Biscuit Co. has begun preliminary construction work on its $2,000,000 plant in Houston, Tex. The project will take approximately 18 months for completion.

Nutrena Mills, Inc., Kansas City, Kan., has purchased the J. A. Pitman Grain Co., Wichita Falls, Tex. The operation consists of a 300,000 bu. grain elevator and 100-ton per day feed mixing plant. R. S. Greenlee, former assistant manager of the Sioux City, Ia. plant, has been named manager of the Wichita Falls plant.

Olympic Dairy, Inc., Seattle, plans construction of a $300,000 creamery which will include a large loading area, a milk bar with plate glass and glass brick front and a glassed-in observation area.

ARTHUR J. GOOD

President of Pickerington Creamery Co., Pickerington, Ohio, Arthur J. Good was elected president of the American Butter Institute at its annual meeting.

L. CHARLES MAZZOLA

Formerly associate editor of Food Industries, L. Charles Mazzola is now executive vice-president of the Riverbank Canning Co., Riverbank, Calif.

O'Rourke Baking Co., Buffalo, is planning an addition to its plant to cost approximately $300,000. Construction is scheduled to begin in the spring.

Red Dot Foods, Madison, Wis., has begun operations at its new potato chip factory in Indianapolis.

Schenley Distilleries, Inc. has begun construction of a $1,000,000 plant in Phoenix, Ariz., to replace a plant destroyed there by fire a year ago. The three top floors of the six-story facility will be a still tower. Six one-story buildings will house a bottling plant, general offices, warehouse, cistern and other equipment. There will be a granary, nine steel tanks of 30,000 gallons each, and a steel water tower. About 20,000,000 pounds of grain will be used annually.

Schwarz Laboratories, Inc., New York, chemical concern, has purchased land and a building in Mount Vernon, N. Y.

Southern Fruit Distributors, Inc., plans construction of a $100,000 plant at Perry, Ia., for canning fruits and vegetables grown locally.

A. E. Staley Mfg. Co., Decatur, Ill., has announced a $15,000,000 modernization and expansion program. A substantial amount will be spent on modernization of the present plant, including the installation of newly developed corn processing machinery. The major expenditure, however, will be on the creation of additional processing capacity.

Swift & Co., Chicago, recently appropriated an additional $250,000 for basic research in foods, agricultural and nutritional problems. A total of $600,000 has been granted to 38 universities and colleges for similar studies during the past three years.

Tea Garden Products Co. has purchased the R. I. McLaughlin Co., Inc. plants at Gresham and Beaverton, Oregon. McLaughlin will continue to operate the plants under their present name as a subsidiary of Tea Garden. T. M. St. Hill, president, stated that the new facilities will be used partially to care for Tea Garden's increasing requirements and to supply cold pack needs of preserving, ice cream and confectionery industries.

PERSONNEL

R. K. Bunnell, formerly with Larabee Flour Mills Co., St. Joseph, Mo., is now superintendent of K.B.R. Mill Co., McPherson, Kan.

Ernest L. Byfield, president of College Inn Food Products Co., has announced the promotion of Paul F. Tevis to the position of vice-president in charge of sales.

M. Frank Cummings has been named assistant to J. Lawrence Alphen, general manager of the General Seafoods division of General Foods Corp., New York.

FABLE OF THE RAT

who didn't know his *BISCUITS!*

You're gazing at a picture of Mr. Rat enjoying his last banquet. It *looked* good, *smelled* good, *tasted* good, but what this predatory prowler didn't know about RODITE was—*to eat it, is to die.*

RODITE, you see, contains a special scent and flavor to entice rats—and a special extract of poison to kill them in an *entirely different way. Through paralysis of their respiratory system!*

The wonderful thing about RODITE is that not only will this ready-prepared cereal cracker lure rodents to their death more surely than ordinary rat poisons—but that it seldom leaves a trace of their foul carcasses on your premises to cause annoying odors and costly "rip-ups".

RODITE is relatively harmless to humans and other animals. Consult one of over 350 West Representatives, specially trained to solve your rodent problems.

Products That Promote Sanitation

WEST DISINFECTING Company

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CLEANSING DISINFECTANTS • INSECTICIDES • KOTEX VENDING MACHINES
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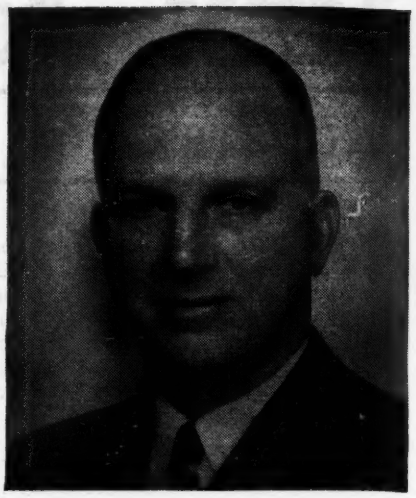


VICTOR T. NORTON

American Home Foods, Inc., New York, has announced the appointment of Victor T. Norton as executive vice-president. Mr. Norton formerly was vice-president of Cudahy Packing Co., and most recently, has been merchandising consultant for Kenyon & Eckhardt, New York advertising agency.

James G. Kennedy, manager of the John P. Squire Co., Cambridge, Mass., for the past 18 years, has retired from Swift & Co., after 47 years of continuous service in the meat industry.

Herbert F. Krimendahl has been elected executive vice-president and a director of Stokely-Van Camp, Inc., Indianapolis, to fill the vacancy caused by the recent death of John B. Stokely.

R. E. Lambeau, former treasurer of The Larsen Co., Green Bay, Wis., has been elected president of the company, succeeding the late Milton W. Larsen. R. H. Winters is the new treasurer.

Dr. Wendell M. Moyer, director of Research of the A. E. Staley Mfg. Co., Decatur, Ill., has been elected chairman of the Division of Sugar Chemistry and Technology of the American Chemical Society. He succeeds Dr. Robert C. Hockett, Director of the Sugar Research Foundation, New York.

Martin V. H. Prinz, formerly research chemist, Omar, Inc., Omaha, Nebr., is now vice-president in charge of production of Miracold of California, Los Angeles.

T. A. Rozsa is now associated with Valier and Spies Milling Co., St. Louis. He formerly was on the engineering staff of Rodney Milling Co.

A. A. Schaal has been made director of the Good Housekeeping Bureau, New York. He formerly was associated with Lever Bros. Co., Cambridge, Mass., where he organized and managed the consumer service department.

Thorough Product Washing

FMC All-Purpose Flood Type Washer

For Spinach and other Leafy Vegetables

Clean spinach is premium spinach. It must be free from dirt, grit, and other foreign matter.

The FMC All-Purpose Flood Type Washer cleans spinach *clean*... does it speedily, efficiently, and economically... and does it with minimum damage to the product.

Leaves are separated and floated in a fanned out position so that a system of water sprays thoroughly *floods out* all the sand, grit and other particles.

As a result you get a top-quality premium product.

The machine also gives cauliflower, broccoli, and other leafy vegetables the same thorough efficient washing.

FMC Products serve every phase of the food industry... from grower to consumer

FOOD MACHINERY CORPORATION

ANDERSON-BARNGROVER DIVISION · **SPRAGUE-SELLS DIVISION**
SAN JOSE, CALIFORNIA HOOPESTON, ILLINOIS

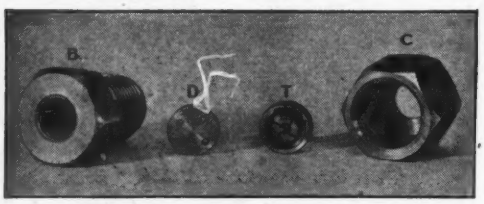
SPRAY DRYING?

Have you tried Monarch H-466 *Carboloy Cemented Carbide* nozzles?

This nozzle is specially designed for Spray Drying work, and for extra long life, the parts subject to wear or erosion are made of Carboloy Cemented Carbide. Other parts are made of 18-8 stainless steel to resist corrosion.

Plants powdering milk, eggs, coffee, molasses, etc., report nozzle life of 50 to 100 times that of nozzles of ordinary materials. Think of the savings resulting from the elimination of "down" time alone!

Write for Catalog 6-A

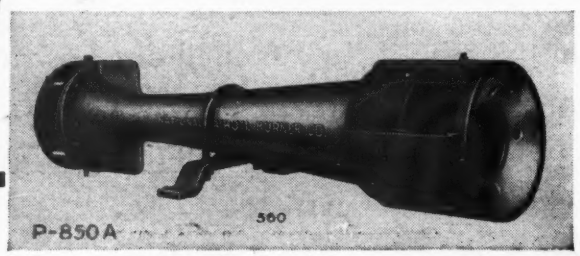


MONARCH MFG. WORKS, INC.

3307 Salmon St. Philadelphia 34, Pa.

NATIONAL AIROIL FUEL OIL - GAS BURNERS

"AIROCOOL" GAS BURNERS



produce a non-luminous flame with highest heat liberation

"Airocool" Gas Burners, of venturi type, assure: maximum percentage of primary air-inspirated; close adjustment of primary air-gas ratio; a non-luminous flame with highest heat liberation throughout its capacity range; and easy removal and replacement of gas orifice.

Its patented "Airocool" Nozzle directs the separate ignitor flames against the main volume of the mixture to insure stable ignition; prevents overheating and burning of the castings; and allows greater turndown without flame burnback.

For full information about "Airocool" Gas Burners and "Airocool" long life Nozzles, write for supplement #3 to bulletin 55.

AIROIL BURNER CO., INC.

Main Offices & Factory: 1272 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.
Texas Office: 2nd National Bank Bldg., Houston

L. J. Schultz is now plant superintendent in charge of production for Stevens Candy Kitchen, Chicago, having formerly been production superintendent for Sweets Co. of America, Inc., Hoboken, N. J.

Jerry Sellers, formerly production manager for Walter H. Johnson Candy Co., Chicago, has joined the King Cole Co., Chicago, as production manager.

J. E. Standiford, vice-president of the Vincennes Packing Corp., Vincennes, Ind., has been elected president of the Indiana Canners Association. Other officers aré: Edward Dunlap, owner of the Plymouth Canning Co., vice-president and A. F. Dreyer, Indianapolis, secretary-treasurer.

E. E. Stewart vice-president of National Dairy Products Corp., and formerly Midwestern zone advisor in Chicago, has been appointed to the executive staff with headquarters in New York. Mr. Stewart also is a director of the Milk Industry Foundation and the National Dairy Council.

S. B. Tatem, formerly assistant in charge of plant food, agricultural chemicals and insecticides sales for Swift & Co., Chicago, is now manager of the company's plant food factory at Los Angeles. He succeeds H. G. Conley, who retired.

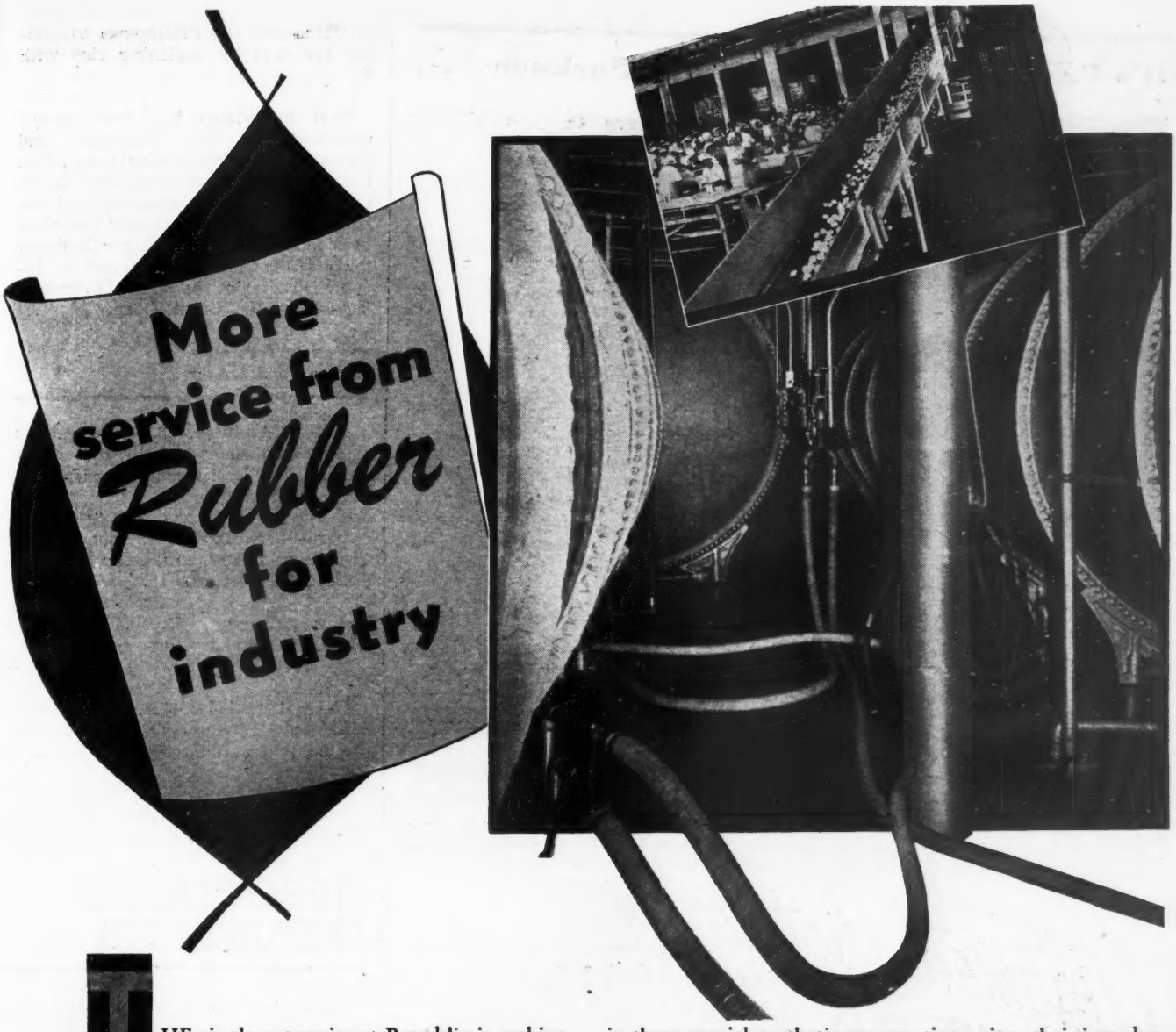
Frank C. Thomas has retired as manager of the coffee and tea department, Sprague-Warner division, Consolidated Grocers Corp., Chicago. Mr. Thomas has been with the company for 55 years. Irving Manning, formerly with Dwight Edwards, San Francisco, succeeds him as manager of the coffee and tea department.

Albert R. Volkmuth, recently returned from military service, has been appointed chief chemist in charge of The Best Foods, Inc., laboratories at San Francisco. Mr. Volkmuth joined the company in 1937.

A. L. Tolin, manager of Swift & Co. plant at Harrisburg, Pa., for the past 20 years, has retired. He is succeeded by R. C. Hoffman.

John J. Vanier, Salina, Kan., has purchased the Black Bros. Flour Mills, Wymore, Nebr. The mill has a capacity of 1,000 bags per day and storage capacity of 50,000 bu. W. B. Kenagy will continue as general manager of the Black Bros. mill.

Dr. Robert R. Williams, director of research of the Research Corp., New York, has been awarded the 1946 Perkin Medal of the American Section of the Society of Chemical Industry for his outstanding accomplishments in fundamental research on Vitamin B_1. Dr. Williams, former chemical director of the Bell Telephone Laboratories, recently initiated a program



THE single enterprise at Republic is making rubber work harder, longer, for industry. The job is approached, primarily, in two ways. One is a program of constant research and product development. The other is a rigid policy of carefully analyzing specific operating conditions before determining the best type of rubber construction, new or long established, to do the job. Typical result in product development is Republic's Reprene line of special purpose belting and hose. Constant advancements in these special synthetic constructions, since their introduction in 1937, have afforded new peaks of resistance to fruit acids, animal fats, oil, heat, etc., for industries where these onetime enemies come in contact with rubber equipment. Greatly increased operating efficiency on all types of mechanical rubber products . . . following overall service studies by Republic industrial rubber specialists . . . is a matter of record from coast to coast. A representative of your nearby Republic Distributor is the first man to see.

REPUBLIC RUBBER

DIVISION

LEE RUBBER & TIRE CORPORATION

YOUNGSTOWN 1, OHIO

REPUBLIC INDUSTRIAL PRODUCTS
YOUNGSTOWN, O.

LEE DELUXE TIRES AND TUBES
CONSHOHOCKEN, PA.

It's Fraction-ounces when you Package . . .

Check-weighing 1 lb boxes of Pecancho Pralines in the Joe Franklin Myers plant, Dallas, Texas

Sound food packaging is a fraction-ounce weighing operation when uniformity and profits are sought. Overweight packages have a habit of mounting into substantial losses where there is volume. Especially is this true in large volume food packaging. It pays to use good packaging scales to catch those elusive fraction ounces flitting away daily without controls in what production men term packaging shrink. EXACT WEIGHT Scales stop these losses . . . apply controls necessary for profitable operation . . . make packaging easier . . . more uniform . . . and certainly more profitable. Write for full details today.

INDUSTRIAL PRECISION
Exact Weight Scales
THE EXACT WEIGHT SCALE COMPANY
21 W. FIFTH AVE. COLUMBUS 8, OHIO
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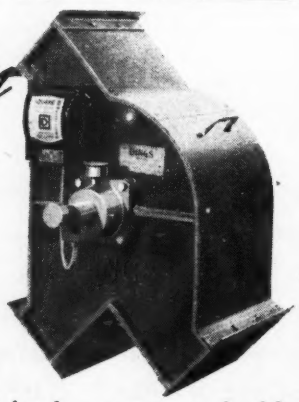
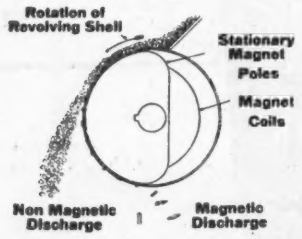
Automatic Protection FROM TRAMP IRON WITH DINGS Drum Type MAGNETIC SEPARATORS



Below is shown the principle of Dings Drum Type Separator operation . . . A powerful stationary electro-magnet holds tramp iron on the face of a revolving drum until drum carries iron out of trajectory of non-magnetic material and discharges it in separate chute. At right is Dings Drum Type Magnet ready to mount.



Tramp iron in food presents a double hazard to processors: It may wreck or seriously damage processing equipment . . . And it is a sure source of trouble if it gets into the finished product.

Dings Drum Type Magnetic Separators afford positive, automatic tramp iron removal when installed in chutes, troughs, piping or spouts . . . "High Intensity" electro-magnetic strength reaches out to catch and dispose of any magnetic foreign materials at rates to match the full-volume production in your plant. Write Dings for details today.

Dings Magnetic Separator Co.
4741 W. McGeogh Ave., Milwaukee 14, Wis.

"Separation Headquarters Since 1899"

Dings
"HIGH INTENSITY"

in China and the Philippines to combat beri-beri by enriching rice with B_1.

Earl B. Wilson has been named president of the California and Hawaiian Sugar Refining Corp., San Francisco. Former president L. R. Campiglia becomes chairman of the board. Mr. Wilson formerly was vice-president of National Sugar Refinery until 1943 when he resigned to become Director of the Sugar Division of the Commodity Credit Corp.

DEATHS

Wilbur A. Baril, 53, vice-president in charge of sales and director of the Chicago milk division, Borden Co., Chicago, November 3.

Samuel E. Dean, 71, founder and chairman of the board, Dean Milk Co., Chicago, November 15.

Henry Mueller, 66, president of the C. F. Mueller Co., Jersey City, N. J., November 10.

John B. Stokely, 41, executive vice-president, Stokely-Van Camp, Inc., Indianapolis, Ind., recently.

Vernon S. Tupper, 66, president of Nashville Roller Mills, Nashville, Tenn,. December 1.

ASSOCIATED INDUSTRIES

American Can Co.'s research facilities at the central laboratory in Maywood, Ill., have been enlarged 25 percent with completion of the remodeling of a third building. Most of the new space will be allotted to the metallurgical, biochemical, fiber container, food inspection and engineering groups. The company presently makes 2,000 different types of containers using fiber and metal.

Globe Steel Tubes Co., Milwaukee, has announced the appointment of Lee Mullen as general manager of sal.s with office in Milwaukee. Mr. Mullen has been with Globe since 1943 and formerly was with Sharon Steel Co., Republic Steel Corp. and Pittsburgh Steel Co.

Jessop Steel Co., has announced the appointment of H. M. Dawson as managing director of Jessop Steel International Corp., formerly known as Jessop Export Sales Corp.

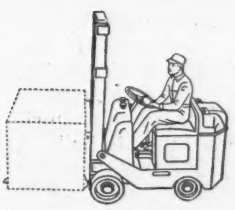
Turco Products, Inc., has appointed L. H. Moulton to the post of national sales director with headquarters at the firm's main offices in Los Angeles. D. T. Buist is the new assistant national sales director.

How to Run Circles Around Competition

In most plants, handling costs are too high. Reduce handling costs and you reduce production costs . . . reduce production costs and you increase profit margins . . . and increased profit margins always give you a head start on competition.

Let's go back to the beginning: You can reduce handling costs to a minimum with a Towmotor Fork Lift Truck, designed for 24-hour, full-power service . . . lifting, transporting and stacking all types of materials and products throughout production and distribution.

There's a Towmotor Fork Lift Truck or Accessory that can bring your handling costs down. Send for a Pocket Catalog.



SEND for special bulletins describing the **TOWMOTOR**

UNLOADER
UPENDER • SCOOP
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EXTENSION FORKS
EXTENSION BACKREST
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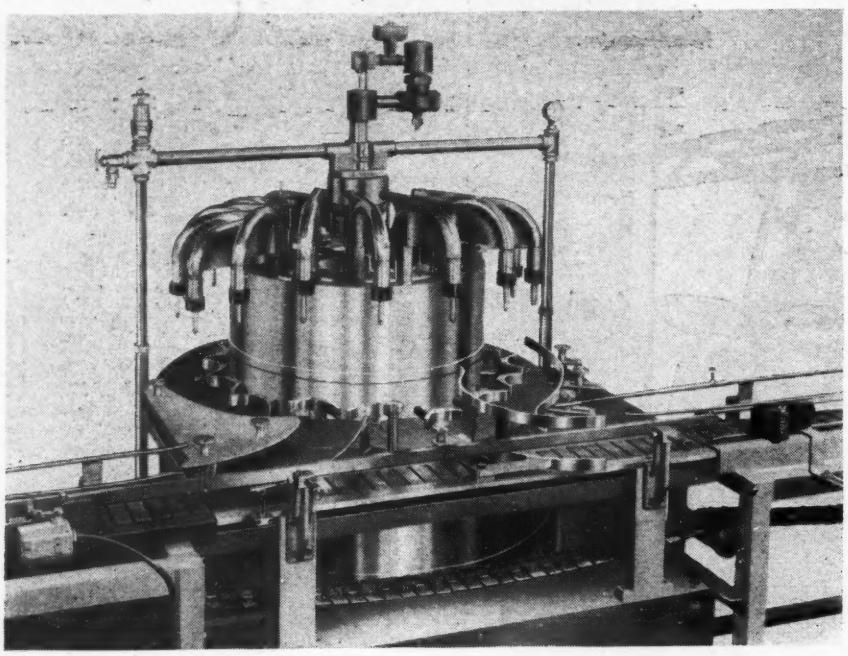
TOWMOTOR CORPORATION
Division 14, 1226 East 152nd Street, Cleveland 10, Ohio

TOWMOTOR THE ONE-MAN-GANG **FORK LIFT TRUCKS *and* TRACTORS**

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

FOOD EQUIPMENT NEWS



Vacuum filler automatically fills any type of container with free-flowing liquid.

Rotary Filler

A ROTARY vacuum filler that will handle any type of container in sizes from splits to gallons—that will bottle any free-flowing non-carbonated, hot or cold liquid automatically—has been developed by Pomona Machine Works, Dept. I, 163 E. Commercial St., Pomona, Calif. Featuring simplicity, ease of changeover between various sizes, and self-cleaning surgical sterilization, the Pomona Filler is built in 2 models: an all-purpose machine rated at 20 gal., 30 half gallons, or 60 quarts or smaller per min.; and a single-purpose machine with a capacity of 120 qt. or smaller per min.

Time Switch

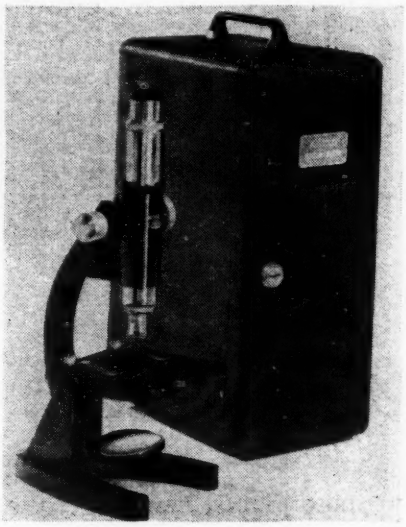
A NEW electric defrost time switch that has been especially designed for cold water spray systems for defrosting condenser coils, has been announced by Automatic Temperature Control Co., Dept. I, Philadelphia 44, Pa. A Telechron synchronous motor continuously rotates a graduated split cam at a speed of one revolution in either 4, 6, 8 or 12 hr. Silver contacts are snapped once in each cycle, which shuts off the fan and compressor for an adjustable period, and at the same instant opens a magnetic 3-way valve in a cold water line, which sprays over and washes down the frosted coils. After the water valve is shut off, water remaining in the pipe to the spray head can flow back to the drain—and a short time delay is permitted in the timer design so that excess water on the coils may drain off.

Shipping Container

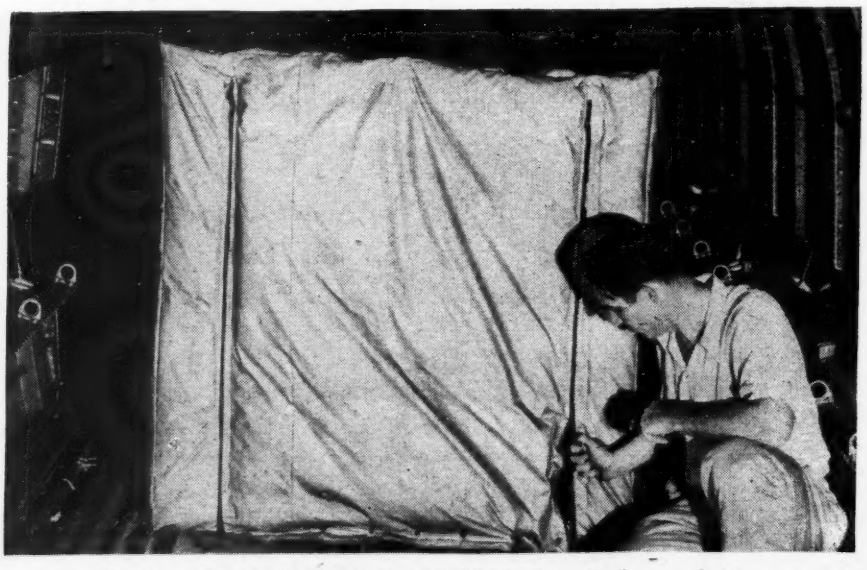
AN AIR shipping container, that will maintain an 80 deg. F. temperature differential for 8 hr. without replacement of refrigerant, is manufactured by Santi-Kraft Corp., Dept. I., Fort Worth, Texas. Overall dimensions are 4 x 4 x 4 ft. The side that can be opened is fitted with pressure-seal, rubber-covered zippers to prevent leakage of air into the container. In the top are 6 pockets for the insertion of slabs of dry ice, 1 x 10 x 10 in. Twelve 1-in. diameter rings in the top of the container permit its suspension from the ceiling of a plane. Fitted with six slabs of dry ice, the container's inside temperature will drop 80 deg. below atmospheric temperatures in 1½ hr., and will hold this differential temperautre for 8 hr. without reicing.

Microscope

SURPRISINGLY INEXPENSIVE, the Federal 40 microscope made by the Federal Manufacturing and Engineering Corp., Dept. I, Brooklyn, N. Y. incorporates many features usually found only in a much higher priced instrument. It is equipped with two Huygenian eye-pieces which are scientifically tapered to afford close eye approach. Convertible achromatic objective can be changed from high to low power by a flick of the finger. Precision lens corrected for chromatic and spherical aberration provides



Microscope with unusual features.

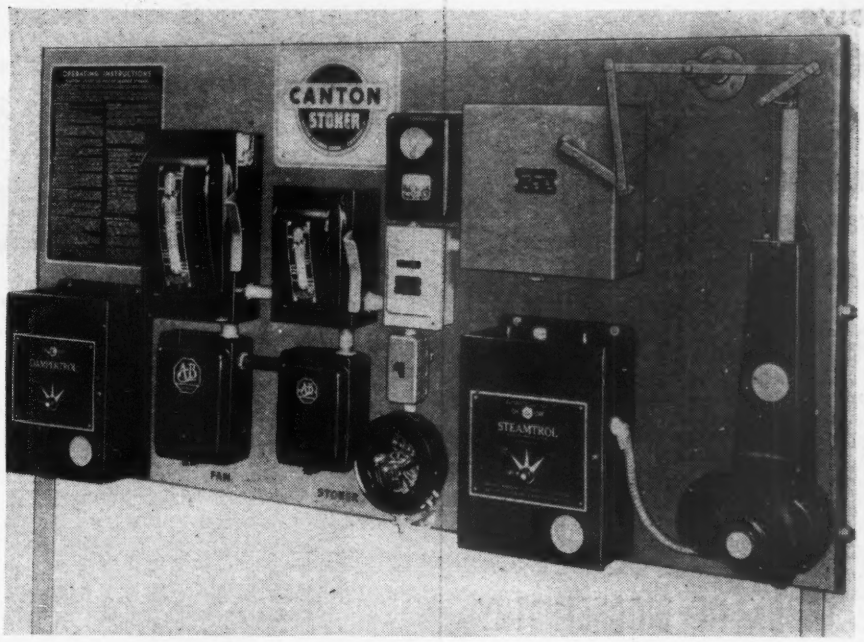


Container for air shipment of perishable foods and other products.

great clarity of detail. Magnification range of 50x to 300x may be still further extended by using additional standard eye pieces or objectives. Coarse and fine adjustments are combined in one shaft, and are mounted on opposite sides of the instrument. A bleeder hole in the lens mount vents trapped air from the barrel so that the eye-piece seats immediately when inserted into the draw-tube.

Stoker Panel Board

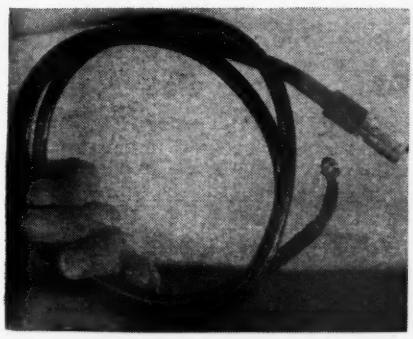
AN ALL-ELECTRIC combustion control system mounted on a heavy steel panel board is offered as a package unit in connection with the stoker equipment of Canton Stoker Corp., Dept. I, Canton, Ohio. Controls are interwired at the factory so that it is only necessary for the purchaser to connect them to the power source and to the proper electric motors on the job. Both motive power and actuating medium are electrically controlled.



Stoker panel board of the All-Electric type comes completely assembled.

Alarm Thermostat

AN ALARM thermostat designed for use in a circuit which will warn of any failure in a frozen-food cabinet has been introduced by the Control Division of the General Electric Co., Dept. I, Schenectady, N. Y. The thermostat initiates an alarm in adequate time to permit correction of



Thermostat to protect frozen food cabinet.

trouble before the contents of the box is spoiled. Contacts should be wired in series with an indicating light, electric clock, or other device to which the user ordinarily gives frequent attention. If the temperature rises to approach a dangerous level, the thermostat opens and the power to the light or clock is cut off. If the power supply to the compressor is cut off the light goes out immediately, warning of trouble before the temperature begins to rise.

Potato Harvester

A HARVESTER that will clean and bag potatoes at the rate of 300 bu. per hr. with a three- or four-man crew has been developed by Food Machinery Corporation's John Bean Mfg. Div., Dept. I, Lansing, Mich. It is towed behind a digger from which it receives potatoes, vines and all. Vines and weeds are deflected by one of the crew to a pair of rubber-covered rollers and dropped to the ground, while the potatoes continue up a conveyor elevator to a set of six, knobbed rubber cleaning rollers. Here loose dirt is brushed from them and small stones eliminated. Potatoes and large stones roll onto a sorting conveyor where three-fourths of the stones are automatically removed. The remaining stones are hand picked by one to three men, depending upon how stony the field is. From the conveyor potatoes move to a rotary bagger with space for three bags, holding up to 100 lb. Adjustable axles permit setting of wheels to track between potato rows.

Air Hose Coupling

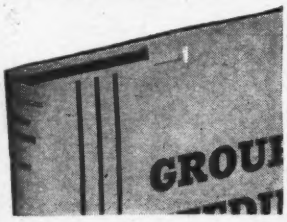
GUARANTEED leakproof under working pressures up to 1,000 lb., the new Wiggins quick connect air hose coupling, eliminates the wasteful leakage of air generated at substantial power cost. An important feature is its greater ease of service. Changing gaskets takes only a minute, reducing maintenance time and keeping production delays down to a minimum. The coupling body does not have to be disassembled, but remains intact while the gasket is quickly removed and replaced. The speed with which the coupling may be connected in this connector also cuts operating costs and promotes efficiency. Besides air, the new coupling will handle oxygen, oil, aromatic fuel, and kerosene. The coupling body has ¼ in. female pipe thread. The entire unit is made of solid aluminum bar stock. It is manufactured by the E. B. Wiggins Oil Tool Co., Dept. I, 3424 E. Olympic Blvd., Los Angeles.

Automatic Clutch

ANNOUNCEMENT of the development of a new automatic clutch which is said to disengage instantly upon overload and so prevent damage to automatic machinery has been made by Polaroid Corp., Dept. I, Cambridge 39, Mass. The clutch employs the automatic introduction of a lubricant between the frictional surfaces to bring about complete disengagement the instant one of the parts is overloaded. The clutch is produced in several different forms. In one type a cylindrical

Potato harvester will clean and bag 300 bushels per hour with a three- or four-man crew.

Solve FOOD PROBLEMS with these four valuable books



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By E. C. CROCKER, Arthur D. Little, Inc., Cambridge, Massachusetts. *McGraw-Hill Series in Food Technology. 172 pages, 5-1/2x8-1/2, 33 illustrations $3.00*

A convenient reference source of information on every aspect of flavor and test. Contains a philosophy of flavor perception, the chemistry of flavoring agents and condiments and methods for developing and retaining flavor in processed foods and other products as well as methods for detection, correction and prevention of undesirable or "off" flavors in commercial products. Gives an odor classification system, and contains a new and enlarged table of volatile chemicals used in flavoring.

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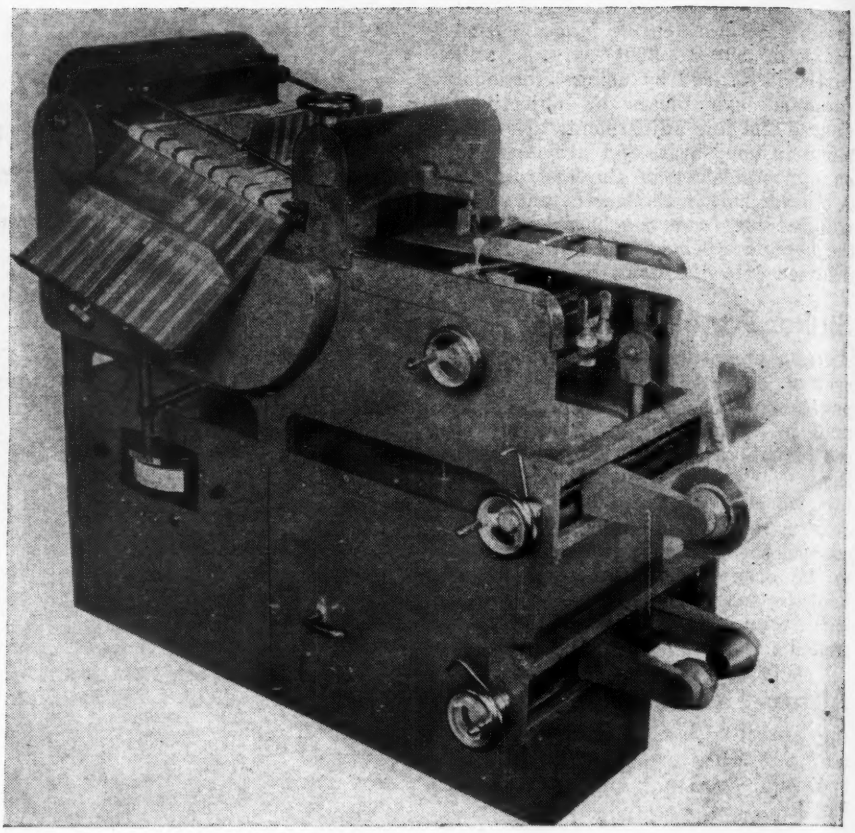

High-speed bag-maker which produces 5,000 to 12,000 heat-sealed bags per hour.

shell attached to a hub incloses another hub containing multiple shoes mounted in such a way as to bear against the internal surface of the shell under controllable pressure. A lubricant within the shell forms a film instantly between the shoes and shell when the transmitted torque becomes excessive since the shoes are free to tip lightly. This produces substantially complete disengagement of the clutch. However, if both shafts are brought to rest or to the same speed, the fluid film is broken and the clutch re-engages.

In another type, adaptable to flexible coupling use, the shoes are molded from neoprene or similar material and expanded by spring loading against the shell. Overloading again causes the lubricating film to form and the clutch to slip.

Bag-Making Machine

AN electronically-controlled bag-making machine which produces heat-sealed bags at the rate of 5,000 to 12,000 bags per hr., with only one operator, has been announced by the Kono-Mead Equipment Corp., Dept. I, 133-23 35th Ave., Flushing, N. Y.

The machine is compact—measuring 27 in. wide, 70 in. long, 52 in. high, and weighing only 1,200 lb. It fabricates bags with combination heat- and glue-sealed seams. Cellophane, or any other heat-sealable film, feeds from a roll at one end of the machine and completed bags are ejected at the other end. The bags may be single-walled or duplex bags in sizes from 2 in. to 18 in. long, and from 1½ in. to 9 in. wide. Operates on 110-115 v., 50 or 60 cycle a.c., and is powered by a ⅓ hp. electric motor.

Vacuum Leak Detector

A PORTABLE leak detector than can locate and measure leaks in vacuum and pressure systems as minute as .00000001 cc. per sec. is manufactured by the Consolidated Engineering Corp., Dept. I, Pasadena, Calif. This instrument electronically separates and measures helium molecules from all dissimilar molecules in the atmosphere. Introduction of helium in suspected areas will give an almost immediate indication on the visual meter

Portable vacuum leak detector

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or audio alarm system whenever any leakage is present. Selection of sensitivity over six different ranges can be had for measuring almost any rate of leakage. Size of the leak can be determined with the audio system when using a helium probe at a distance from the instrument. The pitch of the warning signal changes roughly in proportion to the leak size. Installed in a cabinet 43 in. high, 25 in. deep and 22 in. wide it is mounted on ball-bearing rubber tired casters. The equipment is operated entirely from a standard 115v. 60 cycle lighting circuit.

Signaling Assembly

AN ALARM, which will sound when predetermined industrial processing temperatures, levels or pressures are reached, has been developed by Brown Instrument Co., Dept. I, 4536 Wayne Ave., Philadelphia 44, Pa. The assembly, named "Air-O-Larm" is contained in an explosion-proof housing and is capable of providing either audible or visual warnings. It will be made available immediately.

Gasoline Engine

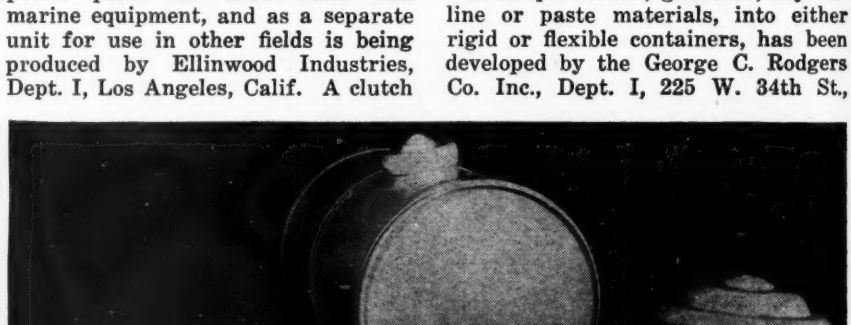
AN AIR-COOLED, single cylinder, gasoline engine which will serve as a power plant for their farm and marine equipment, and as a separate unit for use in other fields is being produced by Ellinwood Industries, Dept. I, Los Angeles, Calif. A clutch and reverse gear assembly in a standard crankcase makes bulky and expensive accessories unnecessary. Specifications call for pressure lubrication, multiple baffle muffler, oil bath-type air filter.

Extinguishing System

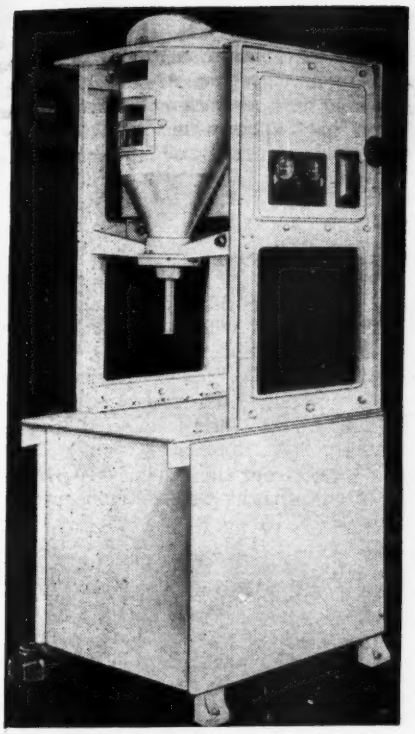
CARBON dioxide hose reel installations are being provided by Walter Kidde & Co., Dept. I, Belleville, N. J., for protection against fire hazards too large for portable extinguishers or unsuitable for built-in systems. In this method of fire extinguishment a hose reel mounted near the point of hazard is provided with up to 100 ft. of ¾-in. hose, the latter equipped with a special nozzle, handle and shut-off valve. The supply, which is piped to the trunnion of the reel, consists of one or more cylinders of CO_2 stored as a liquid under 850 lb. pressure. In multiple-cylinder applications, provisions may be made to use each cylinder singly, or to release all cylinders simultaneously. Local or remote release mechanisms (where cylinders are located at a distance from the reel) are provided.

Package Filler

AN AUGER type package filler, that will fill pulverized, granular, crystalline or paste materials, into either rigid or flexible containers, has been developed by the George C. Rodgers Co. Inc., Dept. I, 225 W. 34th St.,



Air-cooled, single-cylinder gasoline engine.



Rodgers filler for all type containers.

New York 1, N. Y. Simple, completely independent dial adjustments control package fill and transfer time without cams. Operating safety is assured by emergency shut-off switch and complete housing of moving parts. Filler has a range of from ¼ oz. to 10 lb.

Rotary Pumps

THE SIER-BATH GEAR & PUMP CO., Dept. I, 9250 Hudson Blvd., North Bergen, N. J., has just introduced a Gearex Rotary Pump. It is of the positive displacement type and comes in internal bearing models for lubricating liquids and external bearing models for non-lubricating fluids. Available in capacities from 1 to 550 gpm. Discharge pressures up to 250 psi. can be maintained with liquids of medium or high viscosity, 50 psi. on low vicosity liquids, such as water and solvents. Rotors of the continuous herringbone type and discharge passages of the proper area insure continuous overlapping displacement of the liquid. Special alloy materials or jacketed bodies for special services may be supplied to specifications. Either vertical or horizontal mounting may be specified.

Electronic Counter

A WIDE variety of counting applications, ranging from the counting of small objects like pills to the counting of radiation particles (involving counting rates as high as 12,000 per minute), can be handled with the new Model 69-3 multiple electronic counter developed by Potter Instrument Co., Dept. I, 136-56 Roosevelt Ave., Flushing, N. Y. The device consists of five of this company's electronic counters combined in a single cabinet. For

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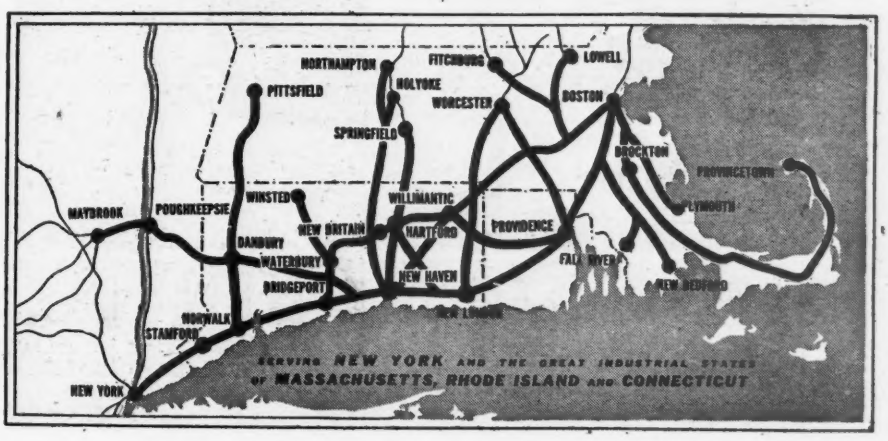

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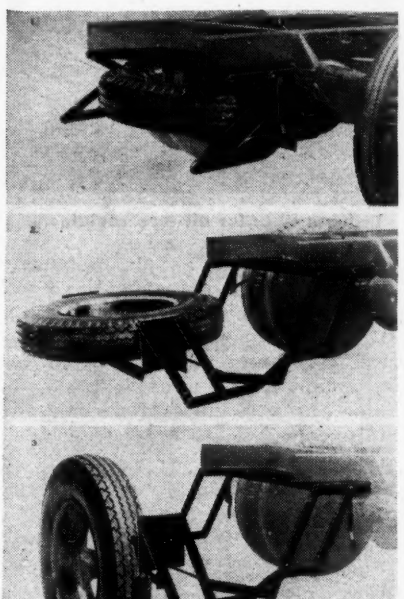
actuating the input to the counter a simple contactor or a photoelectric pick-up may be used. The output is provided with a single-contact, double-throw high speed relay for initiating the control function, which most often is performed by a fast-acting solenoid.

Truck Tire Changer

A TIRE carrier that makes changing truck tires and wheels relatively easy is manufactured by T.E.D. Corp., Dept. I, 928 S. Flower St., Los Angeles 15, Calif. To change a tire the holding clamps are released and the cradle portion of carrier is pulled out and away from the truck body. Tire is tilted upright and detached from

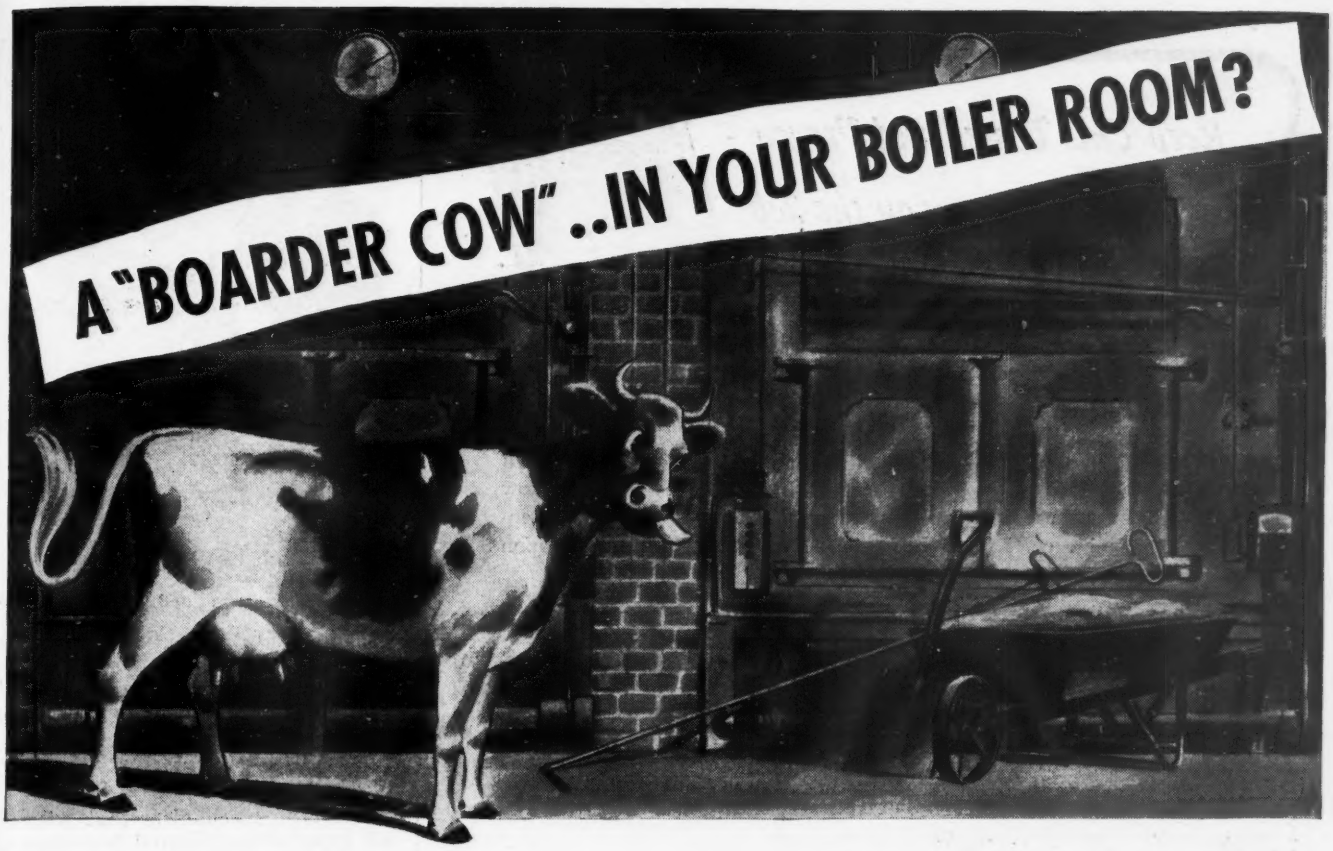


Tire changer eliminates lifting wheels.

carrier by removing holding clamp. Flat is rolled to carrier, clamped to cradle and tilted to horizontal position on cradle swivel, pushed back under chassis and securely fastened. Ted Tire Carrier is made in 2 models: Model A for tires up to 8.25-20 and Model B for 11.00-22.

Foam Nozzle

A NEW fire-fighting nozzle of the dual-purpose type, capable of providing either a clear water stream or a foam stream at the instant option of the operation, has been introduced by American - LaFrance - Foamite Corp., Dept. I, Elmira, N. Y. The new nozzle is of the air-foam type, mechanically creating a foam within the nozzle by entrainment of air and Foamite Air-foam liquid in the water stream. Merely removing the pick-up tube from the container of Airfoam liquid converts the stream to a clear water stream. This foam is said to be particularly suitable for extin-



If you are familiar with dairy farming you know the significance of the expression "boarder cow" — the "critter" that feeds prodigiously but yields only a bare minimum of milk.

Some steam boilers are like boarder cows — eating enormous amounts of fuel for minimum yields of steam.

Check your operating budget to realize the money-loss involved in faulty steam generating. It's a needless loss, too, for steam generating costs can be substantially cut — service vastly improved.

A custom-planned, application-engineered Cleaver-Brooks Steam Generator installation has made lower fuel and steam costs a reality in scores of plants. Here are some of the reasons:

- A steam plant tailored for your job. Cleaver-Brooks analyzes your load conditions, space and equipment arrangements, future growth needs, puts unit into initial operation, instructs as to operation, care, maintenance.
- Designed for utmost convenience of operator—all controls may be operated from front of boiler. A factory engineer puts unit into initial operation, and trains your employees in operation, care, maintenance.
- One source and one responsibility for the complete generator—Cleaver-Brooks factory-finished and tested—a fully "packaged" unit meeting all code requirements.
- Fast installation. No special foundation needed. Within 24 hours after arrival, your Cleaver-Brooks Steam Generator can be in operation.
- No smoke-stack required; simple roof-high vent exhausts combustion gases.
- Saves space, uses less plant area, fits into low head-room locations.
- Oil-firing eliminates smoke, ashes, clinkers, messy boiler-room conditions.
- Low operating costs; unsurpassed guarantee:—80% thermal efficiency from full load down to 30% of its rating; 13% CO_2 gases; stack temperature not to exceed 125° F. above standard steam temperature.
- Quick steaming—for any emergency or fluctuating loads—through high heat transfer with Cleaver-Brooks 4-pass down-draft construction and integral oil-burner.
- Full-size range is available—22 models in sizes from 15 to 500 h.p., at steam pressures from 15 to 200 lbs. p.s.i. Write for bulletin and complete information.

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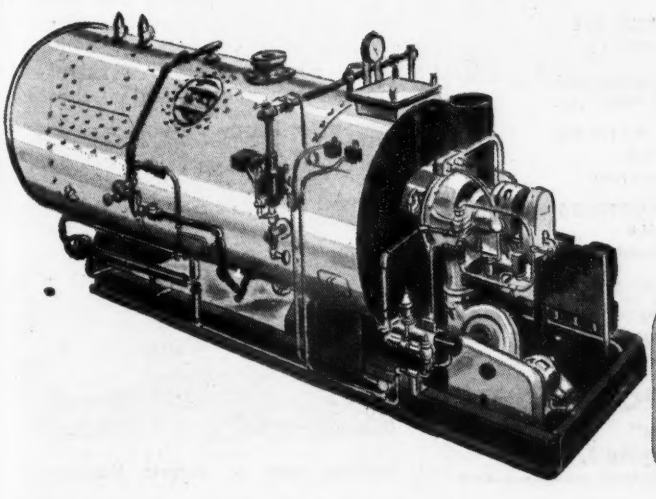

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WRITE on your business letterhead for the Free Steam Cost-Calculator — a ready-reference slide rule showing the comparative steam costs when using oil or coal as fuel.

Keep This Tested and Proven War-Time Veteran on the Job

In many plants TARBONIS (Liquor Carbonis Detergens in a vanishing type cream, odorless, greaseless, stainless) during the war period has proved a real aid in eliminating dermatitis resulting from the handling of a wide variety of foodstuffs, too long immersion of hands in brine, constant contact with acid-type foods, etc. Your plant physician knows also how effective it has proved in clearing up many stubborn skin conditions encountered in industry. Discuss TARBONIS with him, and use the coupon for a generous sample and literature.

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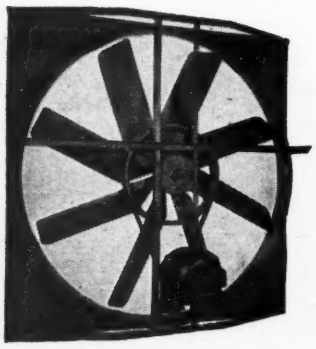

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BIG, QUIET COOLAIR FANS, the product of precision engineering, are built and installed by Breeze Conditioning specialists. They are built in many sizes, ranging from 16 inches to nine feet, and are easily installed in side walls, partitions or on the roof.

COOLAIR DEALERS or agents are equipped to make an accurate survey of your plant, without obligation to you. Further information may be obtained by writing direct to the factory.

ENGINEERS and ARCHITECTS

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ELECTRICAL BUYER'S REFERENCE

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Pioneer Manufacturers of V-Belt Drive Exhaust Fans"
3604 Mayflower Street **Jacksonville 3, Florida**

Delivers beverage and correct change.

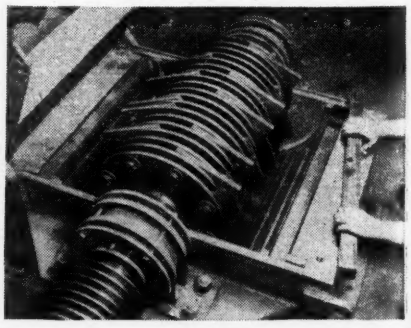
guishing fires in flammable oils, paints and varnishes. The new nozzle is said to be easy to operate as well as light in weight, being only 2½ in. in diameter.

Vending Machine

A VENDING mechanism that will sell all types of carbonated beverages or a combination of beverages, sandwiches, fruit, cookies and candy from a single machine is produced by United States Vending Corp., Dept. I, Chicago 4, Ill. A special feature is the automatic coin changer that delivers the product selected and the correct change in 2 seconds.

Hammer Mill

THE addition of a heavy-duty model hammer mill, to the line of 16 standard types, has been announced by the Buffalo Hammer Mill Corp., Dept. I, Buffalo 3, N. Y. The new model has an overall height of 47 in., base 53 in. x 38 in., charge opening 24 in. x 30 in. It breaks up all sizes of material by shattering blows of several batteries of revolving hardened steel hammers at 1,000 to 7,500 rpm. The material is hit while suspended in mid-air to eliminate the generation of heat from the friction of rubbing and crushing actions. The new model is protected from possible damage by a built-in trap, which extracts foreign substances after they enter the mills



Interior view of Buffalo Hammer Mill.

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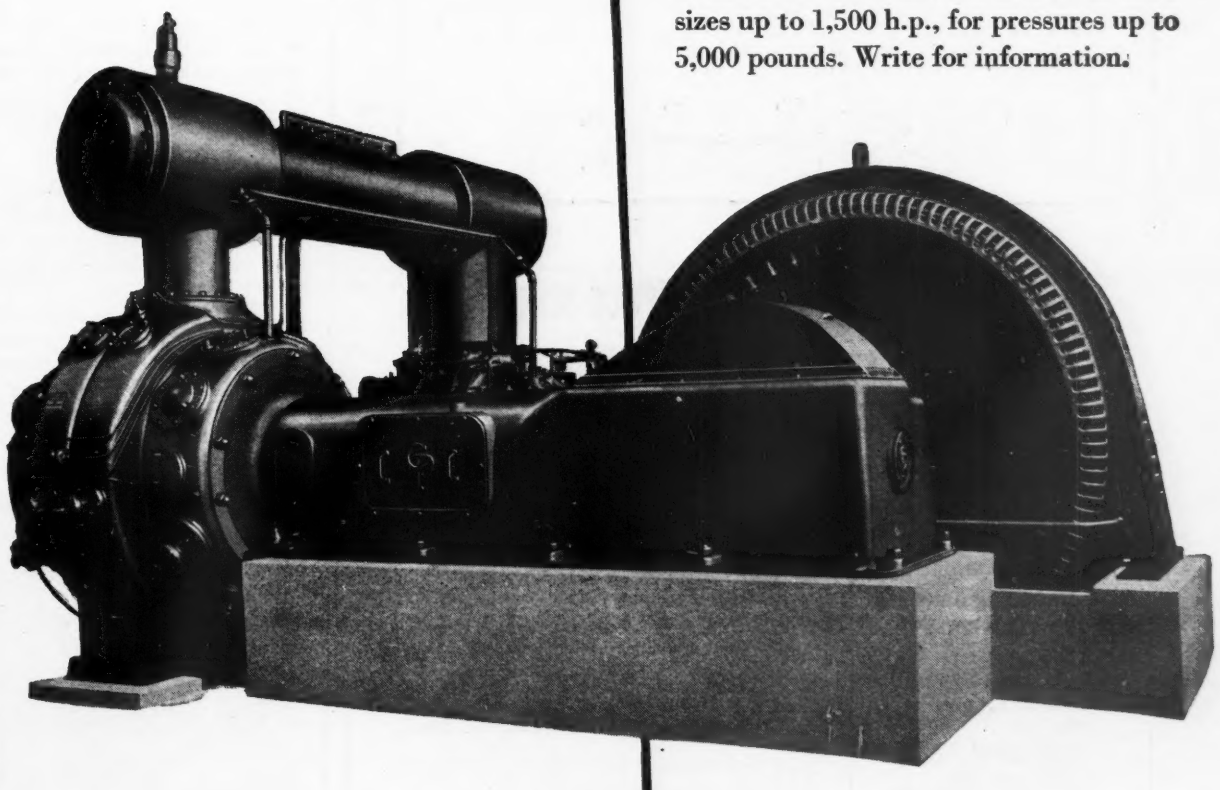
O-CE COMPRESSOR

Ruggedly built and conservatively rated, the CP Class O-CE motor-driven Compressor meets every requirement for continuous, heavy-duty operation, with low power consumption.

High efficiency and dependability result from its quick-acting Simplate valves —streamlined air passages—multi-step capacity regulation—thoroughly effective intercooling and water jacketing and efficient lubrication.

The CP Class O-CE Compressor is of the horizontal, double-acting, water-cooled type, with direct-mounted synchronous motor drive. It is furnished in sizes up to 1,500 h.p., for pressures up to 5,000 pounds. Write for information.



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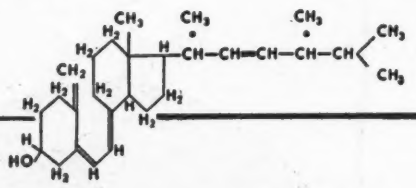
Calciferol

(PURE CRYSTALLINE VITAMIN D_2)

Calciferol is the name applicable *only to the superior, pure crystalline product* as so recognized and used throughout the world.



WRITE FOR DETAILS AND NEW LOW PRICE SCHEDULE

Winthrop's pure crystalline synthetic vitamin D_2 (Calciferol) is free from lumisterol, toxisterol, suprasterol, and other by-products of irradiation. It never varies in antirachitic potency.

OTHER WINTHROP PURE SYNTHETIC VITAMINS:

- **TRIDEE**—Winthrop's Brand of vitamin D_3 in Corn Oil
- **VITAMIN B_1** (Thiamine Hydrochloride)
- **VITAMIN B_2** (Riboflavin)
- **NIACINAMIDE**
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- **CALCIUM PANTOTHENATE**
- **VITAMIN C** (Ascorbic Acid)
- **AMINO-ACIDS**

Valine	Glutamic Acid
Cystine	Tryptophane
Tyrosine	Phenylalanine
Leucine	Methionine

- **"B-E-T-S"**—Winthrop's Brand of Bread-Enrichment Tablets
- **"VEXTRAM"**—Winthrop's Brand of Flour-Enrichment Mixture

POTENCIES AND PACKINGS:

Crystalline Form in vials of one, five, and ten grams.

Solution in Corn Oil: 1,000,000 U.S.P. Units per gram* packed as follows:

400 Standard Units	2,500 Standard Units
1,000 Standard Units	50,000 Standard Units

Also Solution in Corn Oil: 400,000 U.S.P. Units per gram packed as follows:

250 Standard Units	1,000 Standard Units
500 Standard Units	20,000 Standard Units

*Standard Unit=1,000,000 U. S. P. Units

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Special Markets Division
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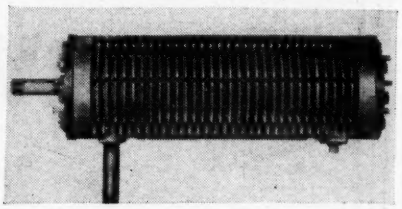
170 Varick Street, New York 13, N. Y.

when used in such industries as abrasive, chemical, cellophane, feed and flour, fertilizer, food, etc. Materials can be discharged in two ways: by gravity from the bottom of the machine, and by conveying pneumatically to a collection system.

Air Heating Unit

GOODYER INDUSTRIES, INC., Dept. I, 224 South Michigan Ave., Chicago, Ill., has developed a new unit, the Aridizer, for heating both air and gases and superheating steam. Temperatures up to 1,000 deg. F. can be maintained with control of leaving



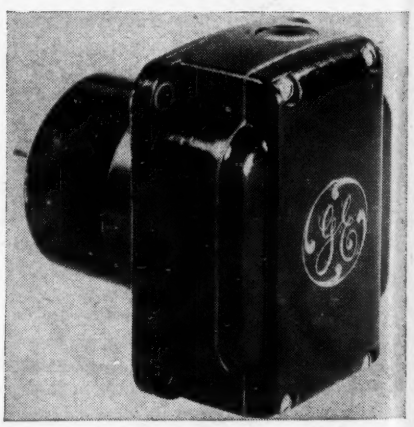
Goodyer Aridizer heats air and gases.

temperatures held within 1 deg. F. Heating of compressed air for drying and dehydrating is made possible by the bilateral fin design of the unit. Heating may be effected by electric calrods, oil or gas burning equipment. When electrically heated the Aridizer can be constructed as an integral part of compressed air, gas or steam heating systems.

Dustproof Switch

OILTIGHT and dustproof plugging switches for flange and surface mounting have been announced by the General Electric Co., Dept. I, Schenectady, N. Y. The new switches are designed to remove plugging power from a motor at the correct moment to keep the motor from restarting in the reverse direction.

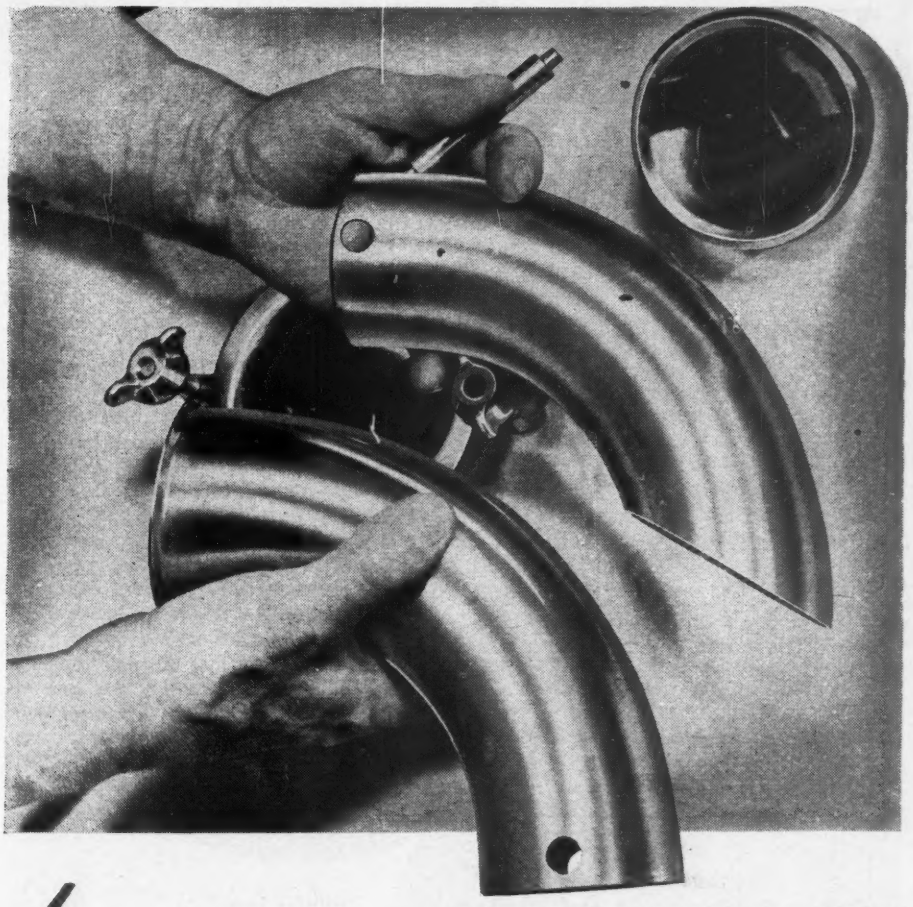
Contacts in the new switches are of silver, and can handle directly the

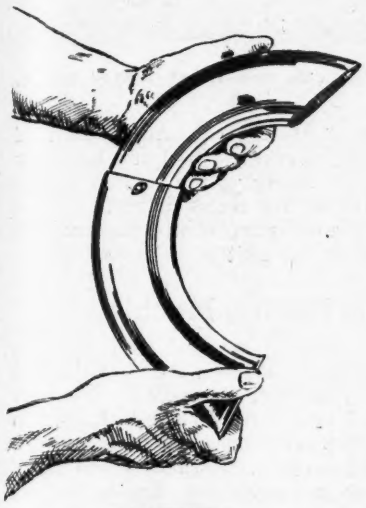


Oiltight and dustproof plugging switch

coil current of a 150-ampere contactor. This eliminates the cost of interlocking relays on starting panels in most applications. Clean contact surfaces are maintained by the wiping action which results from the use of spring-

This stainless steel inlet for a milk storage tank is made in two pieces so that, when disassembled for washing, the entire surface is open to visual inspection.





Safe for MILK *or* MAYONNAISE

..strong..tough..resistant to wear

• Wherever tubing comes in contact with "delicate" products—even easily contaminated foods such as milk or mayonnaise — Republic ELECTRUNITE Stainless Steel Tubing is more than *SAFE* to use.

It's safe — because it is clean, sanitary, and easy to keep clean. It resists corrosion. It does not contaminate metallically. These statements have been proved by a 25-year record established by ENDURO—the metal from which this tubing is made.

And it's strong, tough, resistant to wear. There's no danger of breakage—no wearing through of the surface—because it's solid stainless steel throughout.

But there's even more to the story when you use tubing made by the ELECTRUNITE Process. There's a consistent uniformity of wall thickness, diameter, roundness and workability.

ELECTRUNITE Stainless Steel Tubing is made in a wide range of sizes, gauges, finishes and analyses. For further information, write to:

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